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SOAH DOCKET NO. 473-21-2606
PUC DOCKET NO. 52195

APPLICATION OF EL PASO ELECTRIC COMPANY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

EL PASO ELECTRIC COMPANY'S RESPONSE TO
OFFICE OF PUBLIC UTILITY COUNSEL'S
THIRTEEN REQUEST FOR INFORMATION
QUESTION NOS. OPUC 13-1 THROUGH OPUC 13-17

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DECEMBER 6, 2021

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OPUC 13-1:

Please refer to the Rebuttal Testimony of Mr. George Novela at 10:4 – 13. For each additional 100 MW of peak load added to EPE's system, how much dedicated capacity is required to serve that load plus EPE's planning reserve requirement?

RESPONSE:

Assuming an incremental 100 MW is added to the forecasted native system coincident peak load, EPE would need an additional 115 MW of effective capacity to serve that load (100 MW load plus EPE planning reserve requirement of 15 MW).

Preparer: Victor Martinez — Title: Manager – Resource Planning, Resource Management Regulatory & Quality Assurance

Sponsor: David C. Hawkins — Title: Vice President – Strategy & Sustainability

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OPUC 13-2:

Please refer to the Rebuttal Testimony of Mr. Novela at 15:7 – 17:9. Is it Mr. Novela's position that extraordinary levels of test year kWh or test year demands for one class will only impact the allocation of costs to that one class, or will it impact the allocation of costs among all classes? Please provide a detailed explanation of your response to this question.

RESPONSE:

Allocation factors are determined as a ratio of the energy/demand for each rate class in proportion to the total system energy/demand. A large increase in energy or demand to one class will increase the allocation factors for that class while simultaneously decreasing the allocation factor to all other classes.

Preparer: Enedina Soto — Title: Manager – Load Research & Data Analytics

Sponsor: George Novela — Title: Director – Economic and Rate Research

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OPUC 13-3:

Please refer to the Rebuttal Testimony of Mr. Adrian Hernandez at 6:4 – 19. Is it Mr. Hernandez's testimony that EPE will not use the generating units he has identified as peaker units (i.e., Montana Power Station Units 1 through 4, Rio Grande Generating Station Unit 9, and Copper Generating Station) during the off-peak periods of the first year that new rates are expected be in effect? If so, please provide all analysis, reports or other documentation that supports Mr. Hernandez's position.

RESPONSE:

No.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-4:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 6:4 – 19. Is it Mr. Hernandez's testimony that EPE will operate the generating units he has identified as peaker units during less than 10% of the hours during the off-peak periods of the first year that new rates are expected to be in effect? If so, please provide all analysis, reports or other documentation that supports Mr. Hernandez's position.

RESPONSE:

No.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-5:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 6:28 – 7:5. Please identify where, in the Direct Testimony of Mr. Hernandez, he identified DPROD12 as being a 12CP-A&E allocator for jurisdictional cost allocation purposes.

RESPONSE:

Mr. Hernandez incorrectly referred to the DPROD12 as a 12CP allocator in his direct testimony instead of 12CP-A&E. However, the calculation of the allocator (as shown in EPE's workpapers provided in response to CEP 4-6) and the allocation in the cost of service is correct.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-6:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 6:28 – 7:5. Please identify where, in the Direct Testimony of Mr. Hernandez, he specifically identifies or discusses a 12CP-A&E allocator.

RESPONSE:

See El Paso Electric Company’s response to OPUC 13-5.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-7:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 12:9 – 20. Please identify where, in the Direct Testimony of Mr. Hernandez, he identified DPROD12 as being a 12CP-A&E allocator for class cost allocation purposes.

RESPONSE:

Mr. Hernandez incorrectly described the DPROD12 allocator as a 12CP allocator instead of 12CP-A&E in his direct testimony.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-8:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 18:25 – 19:4. Please provide all studies, analyses or reports that show all residential customers served from a secondary line or a transformer will typically experience their individual monthly or annual peaks during the same hour.

RESPONSE:

Mr. Hernandez is not in possession of and did not rely on any such studies in this case. Instead, Mr. Hernandez relied on the fact that EPE has consistently allocated secondary distribution plant using NCP since its 2009 rate case based on allocation principles about diversity of load and EPE's experience that there is a high likelihood that air conditioning units of EPE residential customers that are served from the same transformer will operate at the same time. Given that the NCP is the sum of each individual customer's peak, regardless of the hour in which it occurs, the NCP allocator accounts for the diversity of demand within the customer class.

Preparer:	Adrian Hernandez	Title:	Senior Rate Analyst – Rates
Sponsor:	Adrian Hernandez	Title:	Senior Rate Analyst – Rates
	George Novela		Director – Economic and Rate Research

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OPUC 13-9:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 18:25 – 19:4. Please identify the customer classes served at secondary voltages for which Mr. Hernandez believes there is no diversity in the demands of individual customers, and please provide all studies, analysis or reports that indicates no diversity exists.

RESPONSE:

Mr. Hernandez never stated that he believes there are customer classes served at secondary voltages with no diversity in the demands of individual customers.

Preparer:	Adrian Hernandez	Title:	Senior Rate Analyst – Rates
Sponsor:	Adrian Hernandez	Title:	Senior Rate Analyst – Rates
	George Novela		Director – Economic & Rate Research

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OPUC 13-10:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 18:25 – 19:4. Is it Mr. Hernandez's position that EPE plans and installs secondary lines and line transformers assuming the customers served from those facilities do not have any diversity in their peak demands (i.e., all customers peak at the same hour)? If so, provide any analysis, reports, documents, including excerpts from EPE's Distribution Standards, that supports that position.

RESPONSE:

No.

Preparer: Adrian Hernandez Title: Senior Rate Analyst - Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-11:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 18:25 – 19:4. Please provide the sections of EPE's current Distribution Standards manual that address the sizing or design standards for secondary distribution lines and line transformers for service to residential subdivisions and to other secondary voltage customers and that address demand diversity of customer loads in the sizing of secondary distribution facilities.

RESPONSE:

Please see OPUC 13-11, Attachment , pages 23-29.

Preparer: R. Clay Doyle   Title: Vice President – Transmission and Distribution

Sponsor: R. Clay Doyle   Title: Vice President – Transmission and Distribution

UNDERGROUND DISTRIBUTION DESIGN STANDARDS
Distribution Design Committee

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UNDERGROUND DISTRIBUTION DESIGN STANDARDS
Distribution Design Committee

I. Glossary of Terms

Sub-loop. A circuit with load which begins at a sectionalizing device, (fuse or breaker switch), and ends at an open point that is backed up by another sub-loop.

Loop. A circuit comprised of a sub-loop and the back feed to the sub-loop.

Feeder. An underground three phase circuit segment that has an unprotected series path back to the Feeder circuit breaker and that has an unprotected series path to another feeder or back onto itself. Underground feeders are composed of 500 MCM conductor or larger (4/0 for some network feeders) and do not directly serve load (with the exception of the downtown network feeders). Taps from a feeder must be accomplished through a protective sectionalizing device such as a fuse or breaker switch.

Trunk. An underground three phase circuit segment, composed of 4/0 conductor or larger, that does not directly serve load, that is fed through a protective device from a Feeder circuit segment. Taps from a trunk must be accomplished through a protective sectionalizing device such as a fuse or breaker switch.

Sectionalizing device. A device capable of disconnecting a circuit segment from its source. Examples: Fuses, elbows, switches, circuit breakers.

Faulted circuit indicator (FCI). A device which senses and identifies the presence of fault current to expedite the location of faulted cable, or equipment, in order to restore service to customers.

Commercial System. An electrical system composed of a preponderance of commercial, (nonresidential with less than an average of 500 KVA per transformer), load.

Industrial System. An electrical system composed of a preponderance of industrial, (nonresidential with more than an average of 500 KVA per transformer), load.

200 Amp Source. A riser or a tap from the breaker compartment of a switchgear that is limited to 200 amps by the current-carrying capability of the electrical components of the underground system (ie. loadbreak elbows, splices, terminators, cable, etc.).

600 Amp Source. A riser or a tap from a switch compartment of a switchgear that is limited to 600 amps by the current-carrying capability of the electrical components of the underground system (i.e.; non-loadbreak elbows, splices, terminators, cable, etc.).

Padmounted Tie & Tap Switchgear, (PTTS): This refers to Padmounted switchgear that provide feed-through tie and protected tap capabilities. These include Padmounted switches commonly referred to using nomenclatures such as PMH-X, PME-X, PVI-X, and Solid Dielectric.

II. Equipment Limitations

Underground JCN and Power Cable Limits

TABLE 1

	Maximum Sub-Loop Current	Maximum Loop Current	Maximum Trunk Current
2 AWG, 15kV, JCN	55	110	
1/0 AWG, 25 kV, JCN	80	160	
4/0 AWG, 15kV, JCN	100	200	
4/0 AWG, 15kV Power	100	200	300
4/0 AWG, 25kV, Power			300
750 MCM, 15kV Power			600
750 MCM, 25kV Power			600

Electrical loading on sub-loops, loops, and trunks will be limited to the cable current carrying values shown in Table 1. These are the maximum allowable currents given no other restrictions. The Planner should consider other issues such as maximum allowable number of customers on a circuit and feeder balancing when deciding which cable to use for a given circuit and the amount of load to place on each cable. Current shall be calculated using the total diversified customer load, whenever possible, (if diversified customer load data is not available, calculate load current using connected transformer kVA).

III. Guidelines for Residential Underground Subdivisions

a. **Application**

These guidelines apply to residential developments composed of 20 or more lots and/or with 3 or more transformers.

b. **Loop vs. Radial feed**

A loop design is preferred, but under some circumstances, a radial feed may make more sense. Use the guidelines below to determine the design methodology:

- Divide the total distance (ft.) of primary circuit by the diversified load (KVA). If the result is 12 ft/KVA or less, a loop shall be built. If the result is larger than 12 ft/KVA, a radial feed shall be allowed.

Examples:

1. 100 KVA diversified load, a distance of 1000 ft. So, 1000/100 = 10 ft/KVA. A loop shall be built.
2. 50 KVA diversified load, a distance of 1000 ft. So, 1000/50 = 20 ft/KVA. A radial feed shall be built.
3. 25 KVA diversified load, a distance of 120 ft. So, 120/25 = 4.8 ft/KVA. A loop shall be built.

This formula should be applied to the entire length of circuit. If a radial is fed from a sub-loop, the entire sub-loop must meet the established criteria to allow a radial to be designed. If the entire sub-loop does not meet the criteria, the new section of primary distribution will be designed to be part of the existing sub-loop. See Figure 1 on page 5 for other examples.

c. **Sectionalizing**

1. Residential underground sectionalizing shall be accomplished using a single phase enabled breaker switch in switchgear, an elbow, an approved fused elbow, or a riser fuse.

2. Residential line extensions should be kept separate from circuits containing commercial loads, (especially 3-phase loads) when possible. When a residential circuit must be fed from a three-phase commercial circuit, a single phase sectionalizing device (i.e. MVI breaker switch or an approved fused elbow) shall be installed to protect the 3-phase circuit from a fault on the single phase residential line.

3. The number of customers served per sub-loop shall not exceed 125.

4. The distance between sources (sectionalizing devices) on a trunk should not exceed 2500 ft. If the distance exceeds 2500 ft., a sectionalizing device should be installed as close as possible to the center of that run.

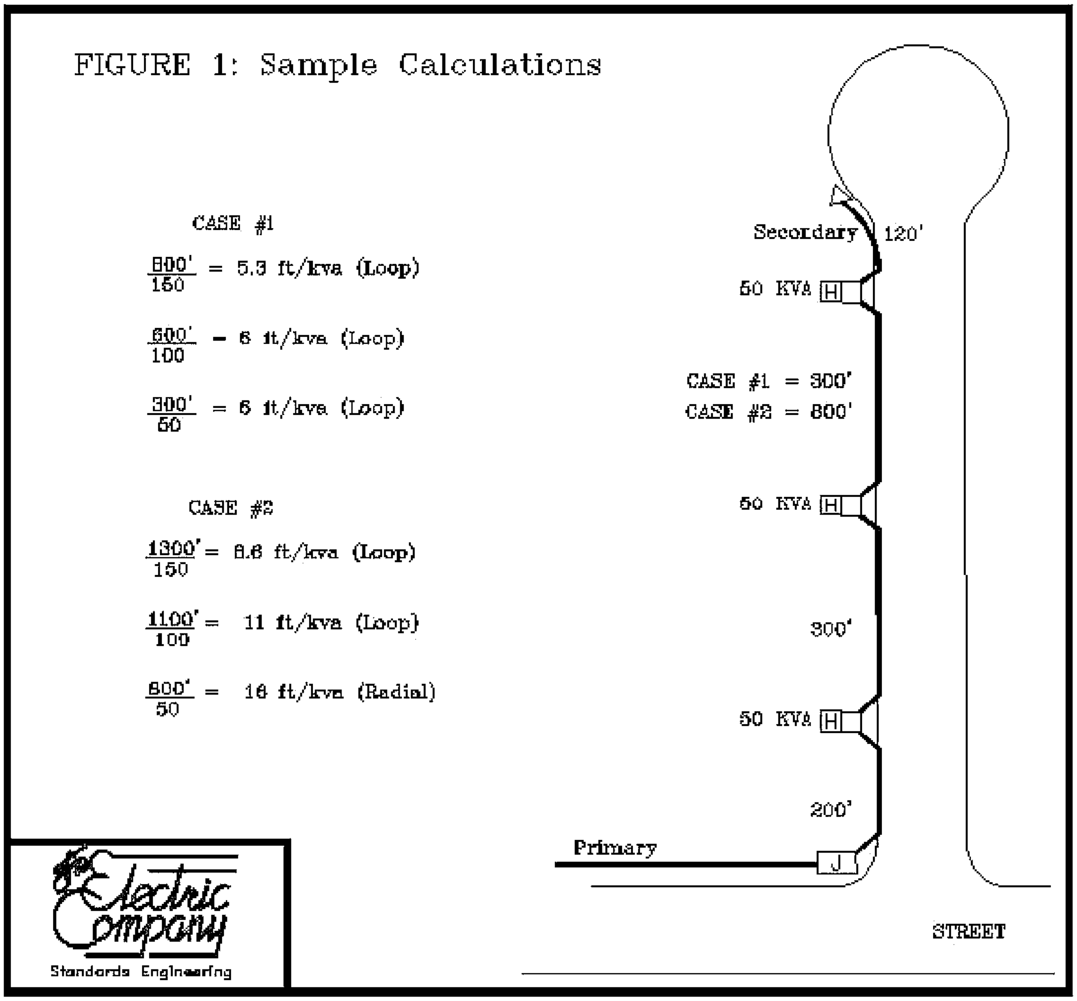


FIGURE 1: Sample Calculations

d. General Guidelines

1) Sub-loops, loops and trunks will be limited to the maximum load criteria shown in Table 1 (page3).

2) The maximum number of customers served from a residential transformer should be limited to up to 12.
    1. **Exception: If the average lot width is less than 40ft. (as in mobile home parks), the number of customers that can be served from a single padmounted transformer can be increased to twenty.**

3) The voltage drop should not be more than 2% from the secondary bushings of the transformer to the farthest meter.

4) Voltage flicker shall be limited to 6% using an electrical load equivalent of the largest refrigerated air conditioning unit estimated for residences in the study area, placed at the farthest meter from the transformer without steady state load being applied.

5) Where physical restrictions limit the amount of space available to install pullboxes, a trunk circuit can be installed in transformer assemblies. In this case, the transformer pullbox must be a 100" box.

6) There shall be no more than one secondary street crossing per transformer and there should not be more than three series secondary line segments from a transformer (including the service run).

7) Elbow arresters shall be installed on all unused transformer bushings. Parking stand arresters shall be installed on all energized cable ends not attached to a transformer bushing.

8) Optimally, 2 sources shall be used to serve a looped system, but no more than three shall be used.

9) Transformer sizing shall be in accordance with the Demand *Diversity as Applied t*o *Transformer Selection and Voltage Drop Calculations*, Case 1 “Residential Subdivision Design”.

10) Primary cable in any underground system shall not be designed to be left de-energized for periods of time greater than six months.

11) Diversified Demand Chart for Riser Fuse Sizing
    a) The Diversified Demand Chart can assist when determining riser fuse size. However, the Diversified Demand Chart will not assist with protective device coordination, (which is the first concern when sizing riser fuses). It provides insight into possible fuse overloading due steady state loads that the riser fuse may see in the future. So, if the Diversified Demand Chart indicates that the loop load current at the riser is 70 amps, the riser fuse will need to be an 80 amps or larger fuse.

12) Residential Subdivision Load Separation (Phasing) Criteria
   a) A second phase will be used when a single loop current exceeds 80 amps.
   b) A third phase will be used if the total load current exceeds 160 amps.
   c) If the total diversified load is greater than 240 amps, balance the load among the three phases as possible up to the primary cable's ampacity. (Ampacities for each cable are; 2 Al 104 amps, 1/0 Al 149 amps, and 4/0 Al 200 amps)
   d) If any of the cable ampacities are exceeded an additional source, (riser), will be needed.

13) **Transformer** Pullbox Sizing in **Residential** Developments
   a) A 60 inch pullbox is to be used when the following conditions are proposed or exist:
      i) Less than 6 secondary conductors entering it
      ii) Have no Junctions, and no splices.
   b) An 80 inch pullbox is to be used under the following conditions:
      i) Has a multi-phase circuit entering it
      ii) Has less than 6 secondary conductors entering it
      iii) A single phase primary circuit, feeding in and out of the transformer (including a primary circuit that leaves the transformer and returns to the pullbox, is spliced, and then feeds to another pullbox)
      iv) Has no more than any combination of three Junctions and/or Splices.
      v) Has a single phase circuit with a Junction installed in the box.
   c) A 100 inch pullbox is to be used under the following conditions:
      i) Has more than 6 secondary entering it
      ii) Contains a single-phase circuit with a breaker switch
      iii) Contains multiple primary circuits in and out of the pullbox

14) Planners are especially encouraged to talk to the area Operations Engineer concerning riser fuse sizing and load balancing.

e. <u>Faulted Circuit Indicators</u>

1. FCI's shall be installed on the line side of any switchgear (PTTS-9) feeding another switchgear (PTTS-9).
   Only one set of indicators is needed per switchgear, and it shall be installed on the way feeding the downstream switchgear (Typically way 2).

2. FCI's are submersible and can be installed in pull-boxes or vaults when required. This is not a common practice.
   Indicators shall only be installed on Junction 3, Junction 4, or Stacking elbows when required by the complexity of the circuit.

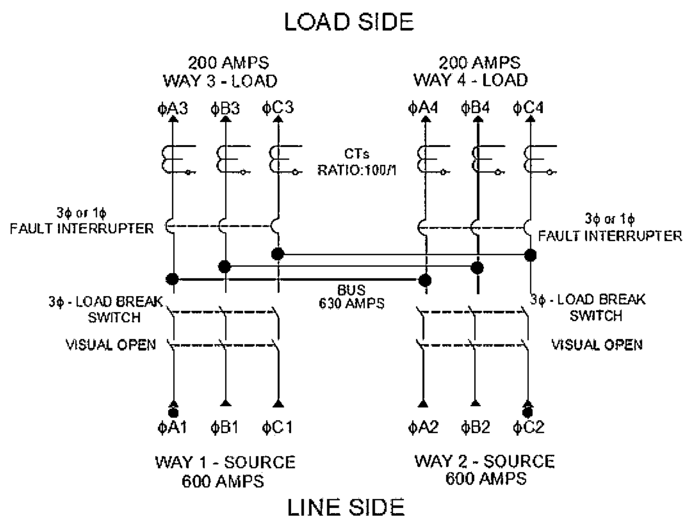
   The Distribution Monitoring area engineer will determine when this are required.
3. FCI's are not required in three-phase or single-phase transformers on a sub-loop.

4. However, FCI's can be installed in transformers on older/trouble areas when required by the Distribution Monitoring area engineer.

5. The indicators on any given sub-loo shall be kept to a minimum.

6. An FCI shall be installed in the first transformer of a sub-loop, and in the middle of the first transformer and the open point.

PTTS ONE-LINE



IV. Guidelines for Commercial Underground Design

a. **Application**

Underground electrical systems composed of a preponderance of commercial load. Underground Commercial systems serve nonresidential load that have or, are projected to have, at least four three phase and/or six single phase transformers with an average transformer size of less than 500 KVA.

Loop Feeds

1. As a general philosophy, protected loop feeds, feeding through transformers, shall be employed when:
   a. When 4 transformers or more are served and total connected KVA is 300 or more, or
   b. When 4 transformers or more are served and 24 or more meters exist.

2. Elbow arresters shall be installed on all unused transformer bushings. Parking stand arresters shall be installed on all energized cable ends not attached to a transformer bushing. This applies to both 13.8 and 23.9 KV systems.

3. The use of junctions will be kept to a minimum in looped systems. This serves to make fault detection simpler and restoration of service much faster by isolating the faulted equipment from the loop.

c. Master Planning an Underground Commercial Development

1. Upon initial customer contact, the Planner shall develop, and document, a plan to provide service to the entire development. The master plan should address:
   a. Possible ties to surrounding developments,
   b. The projected growth of the area,
   c. The extent of the proposed underground loop or loops, and
   d. The source location of each loop/sub-loop

2. Alternate feeds to the development should come from the same feeder, if possible. When opposite feeders must be used, a three-phase, two-way switch shall be placed at the open point. A normally open switch number shall be assigned to the switch. The Work Order map should indicate "***Caution – opposite feeders***", at the open point and a Warning Sign feature shall be at that location in the GIS.

3. Only two sources shall be used to serve a looped commercial system.

4. When the total loop current, calculated using the total diversified customer

load, (use connected transformer kVA if diversified customer load data is not available), exceeds 200 amps, two commercial systems should be created utilizing two separate sources per system. The sources can be risers, breaker switches from switchgear sourced from a 600 amp feeder or trunk, or any combination of the two.

e. Underground Commercial System Design Considerations

1. Maximum electrical load current shall not exceed the values shown in Table 1 (page 3) for any cable size used at EPE.

2. The maximum number of transformers per sub-loop is 10.

3. When the first structure (i.e. pullbox) is located more than 150 ft. from a riser, an intermediate pull-box shall be installed.

    a. If the cable is 500 MCM or greater, the first structure from the riser shall be a minimum of 25 feet for single conductor risers and 50 feet for three conductor risers.
    b. If the cable is less than 500 MCM, the first structure from the riser shall not be closer than 10 feet from the riser pole.

4. Residential or commercial single-phase taps from Commercial Underground three-phase Systems shall be avoided. If necessary, single phase taps shall be limited to a total connected load of 50 amps. If the total connected load is greater than 50 amps, consult with Standards Engineering. The tap is to have a properly coordinated protective sectionalizing device at the tap point. Refer to Section VI for more detail.

5. When multiple single-phase circuits are to be fed from a three phase Commercial Underground system select from one of the following options: 1) When the single-phase circuits are at the end of the three-phase circuit, install a Two-Way, Three Phase, Breaker Switch with independently operating phase protection. 2) When the single-phase circuits tap a continuing three phase circuit, install a PTTS-9 switchgear with independently operating phase protection.

6. Transformer sizing shall be in accordance with the Demand Diversity as Applied to Transformer Selection and Voltage Drop Calculations, Case 2 "Commercial or Industrial transformer selection" document.

e. **Use of Switchgear**

1. PTTS-9, (or equivalent), installations:
    a. PTTS-9 switchgear shall be used to sectionalize underground Feeder or Trunk circuits **and** provide Feeder and Trunk circuit protection from attached load.
    b. A reducing tap well, a 200-amp bushing insert, and an insulating cap shall be installed on the back of switch side elbows to provide a means to ground cable for maintenance activities on normally closed switches.
    c. A reducing tap well, a 200-amp bushing insert, and an elbow arrester shall be installed on the back of the switch side 600-amp elbows on normally open switches.

2. At least four 200-amp sources (for example, two **PTTS-9** switchgears, four risers, or a combination thereof) shall be used if the Commercial Underground System has a calculated load current greater than 200 amps based on connected transformer kVA or if it serves 20 or more customers.

f. Operating Considerations

1. The use of 80” Pullboxes in Commercial Systems are limited to:
    a. Having no more than 6 splices,
    b. No junctions when there is padmounted equipment installed on the box (existing or planned),
    c. A maximum of twelve (12) conduits,
    i. A 100” pullbox will be used when the limits above are exceeded.

2. Loadbreak equipment, especially junctions, will not be placed in manholes.

3. The distance between structures shall be determined by pulling tension and sidewall pressure calculations only.

4. Pulling through structures without splicing shall be allowed if the pulling tension is less than 200 pounds **and** if the distance to the next structure is less than 100 ft.

5. Transformer placement should be in accordance with DSU’s 515 or 520. Line truck access to transformers must be provided for construction and future maintenance of the equipment by placing units near parking lots, driveways, or other large vehicle accessible areas.

6. For customer-initiated Work Requests, transformer installation protection, bollards, must be installed by the customer prior to the energizing the electrical facilities. When transformer installations are installed or substantially altered for Service Betterment work, EPE shall install the bollards.

7. On the 13.8/7.97 system, three phase risers that feed 2500 kVA transformers are to have a 200-amp E-speed riser fuse. Refer to DSU 1725 for all other riser fuse sizes.

8. When designing a looped commercial system, it is preferred that splices or junctions not be placed in pullboxes beneath equipment such as transformers or switches. If this cannot be avoided, consult with the Underground Construction Supervisor prior to completing the design to discuss the operating issues that will be created.

a) Equipment allowed in Pullboxes and Pullbox Assemblies – drawings will be developed and added to the Assembles for clarification.

b) Letter f. Operating Considerations - Paragraph 1. a, the limitations for the use of the 80" Pullboxes in commercial Systems will be revised to correct contradiction with information provided on paragraph 8.

V. Structural Guidelines for Underground Distribution Design

a. **Design Considerations**

1. Transformers and switchgear should be installed in private property when possible.

2. Conduit, pullboxes and service enclosures can be placed in the street right-of-way if the parkway is at least 40 inches wide. If a parkway does not exist or is less than 40 inches wide, facilities shall be installed in private property.

3. When the parkway is less than 40 inches wide and there is a differential elevation between lots of more than 4 feet, conduit shall be installed in the street ROW (sidewalks or parkways).

4. Primary facilities should be designed in the front of the property (street side access) in residential subdivisions and at the back of the property for commercial and industrial subdivisions.

5. All primary installations shall have at least one spare duct capable of accommodating the largest cable installed in the ductbank. Exception: when a circuit loops into and out from a load using the same trench, (for instance, as in a cul-de-sac).

6. Service enclosures should be placed (as much as possible) at every other lot line to serve two loads.

7. Service enclosures shall be placed directly in line with secondary conduit, as much as possible.

8. Any duct buried 48 inches or less, should be terminated with 45-degree elbows into pullboxes or service enclosures.

9. See Table 2 (page 15) for burial depths and concrete encasement requirements. **Two-sack mix will not be allowed to substitute for concrete encasement.**

10. No primary duct shall be buried less than 18 inches without Standards Engineering advisement.

11. Backfill: All backfill should comply with DSU 1405 and UD-300 section 2.2.4. When governmental agencies require 95% compaction and field conditions prevent native backfill to achieve these compaction requirements, 2-sack mix or crusher fine will be used.

12. Traffic bearing pullboxes should only be used in locations where light traffic is possible based on the restrictions described in DSU 1205. Also, final grade information is vital to correct traffic bearing pullbox placement.

TABLE 2

Primary Duct

	Normal Cover	Concrete Encase	Minimum Cover
Under Roadways	**38-48"**	**Always**	**18"**
Parkways	**38-48"**	**<24"**	**18"**
Private Property	**38-48"**	**<30"**	**18"**

Secondary Duct

	Normal Cover	Concrete Encase	Minimum Cover
Under Roadways	**24-36"**	**<24"**	**18"**
Parkways	**24-36"**	**<24"**	**18"**
Private Property	**24-36"**	**<24"**	**18"**

Concrete Encasement: (For Dig-in protection):

Applications:

1. Conduits containing or, that will contain, primary underground cable installed in a paved street
2. Utility main crossings in private property, (perpendicular to other utilities, 5 feet on each side)
3. Conduit with less than 24 inches of compacted backfill (crush protection)

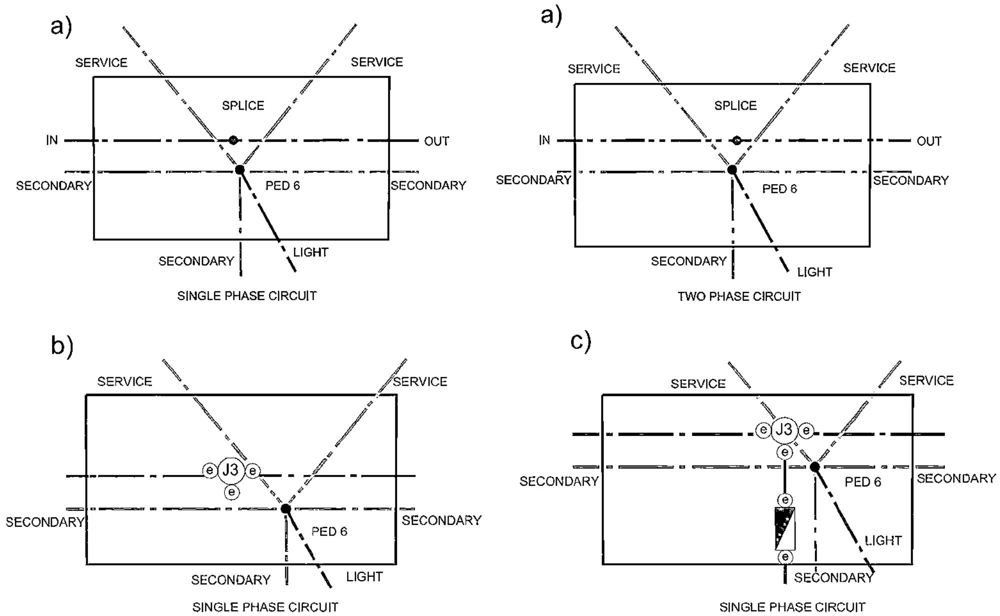
EPE concrete specifications are; 3000 psi, with ¾ "aggregate gravel, and a slump of 3 to 5 inches. (Refer to DSU 1610, NOTES, for details)

(2-sack mix will not be allowed as a substitute for concrete encasement)

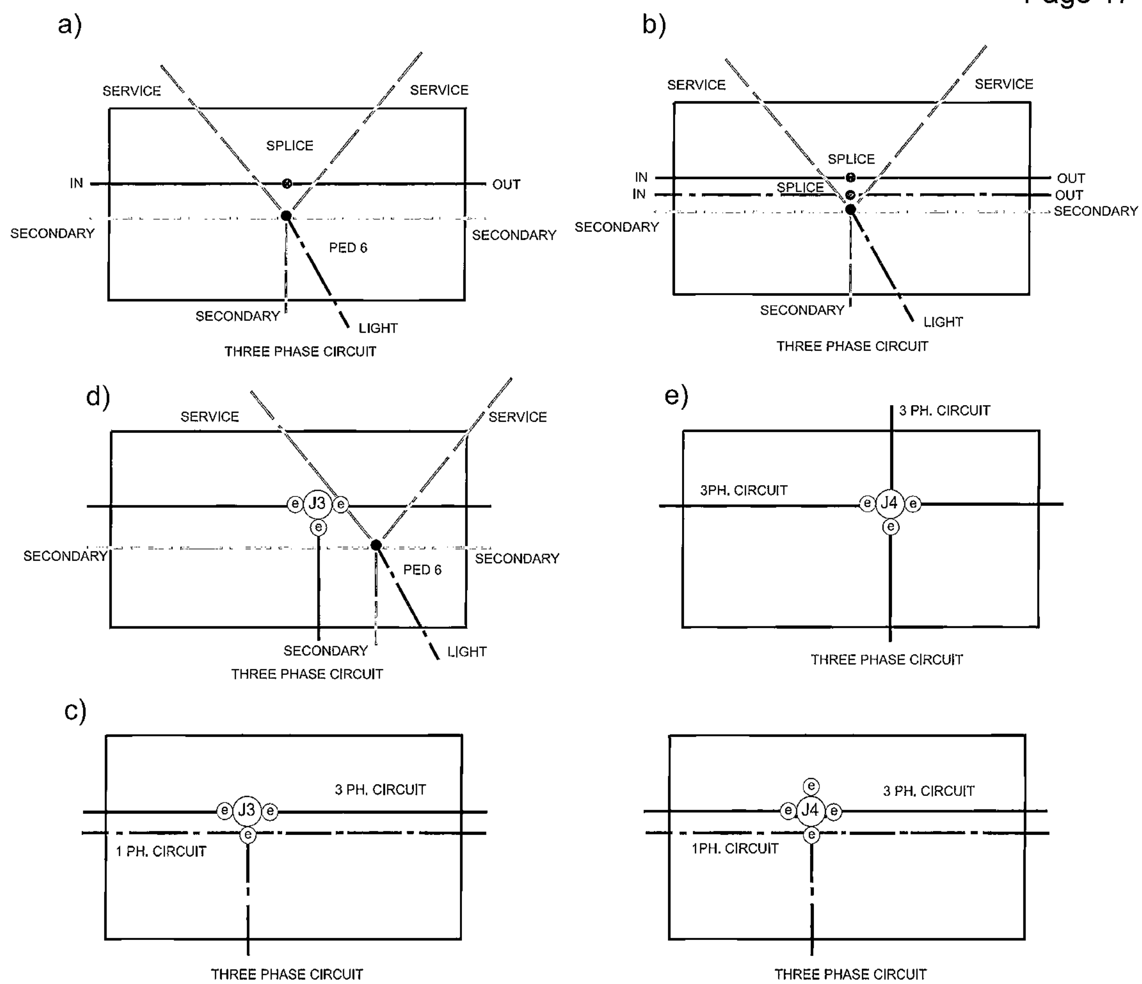
Equipment Allowed in Pullboxes and Pullbox Assemblies:

Assembly-J, (60" pullbox)

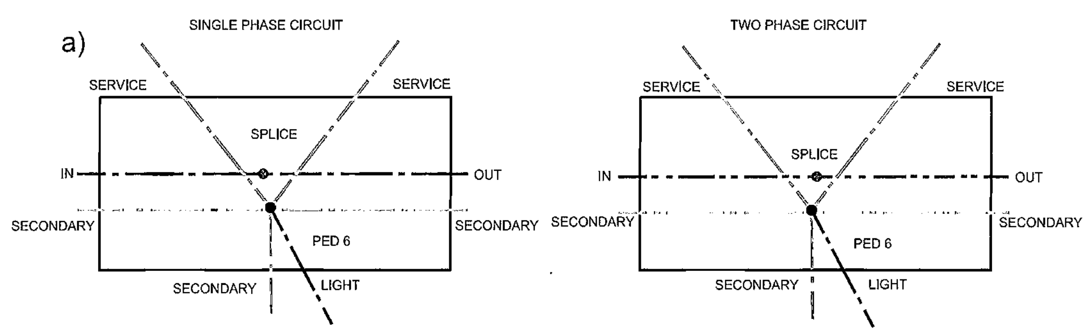
a) Single or two-phase circuit, (in and out only), and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
b) Single phase circuit with a junction with a single-phase circuit tap and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
c) Single phase circuit with a Breaker Switch and a single-phase tap and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6



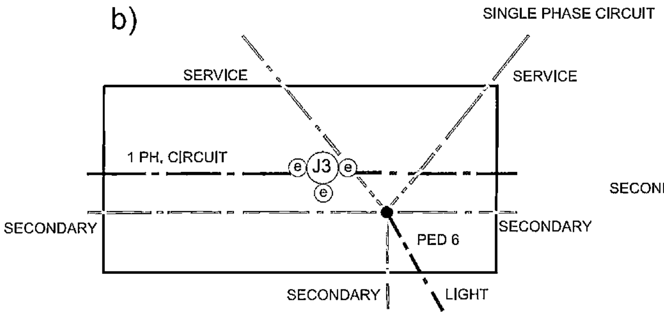
2. Assembly-A, 80" pullbox and Traffic Bearing Pullbox
   a) One three phase circuit, spliced, in and out of the pullbox and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   b) One three phase circuit, spliced, in and out of the pullbox and one single phase circuit, spliced, in and out of the box and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   c) One three phase circuit, and one single phase circuit, with one Junction three or four on one of the cables and the additional single-phase circuit(s) fed from the Junction
   d) One three phase circuit with a 3-way Junction, (and a three-phase circuit tap), refer to Section IV.f.1 for further details and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   e) One three phase circuit with a 4-way Junction, (and 2 three phase circuit taps), refer to Section IV.f.1 for further details



3. <u>Assembly-P, 80" x 36" pullbox, (Parkway box)</u>
   a) Single or two-phase circuit, (in and out only), and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   b) Single phase circuit with a junction with a single-phase circuit tap and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   c) Single phase circuit with a Breaker Switch and a single-phase tap and one secondary circuit (up to 350 MCM) feeding a fully occupied PED-6
   d) **<u>No Padmounted Equipment is allowed on any Parkway Box</u>**



b)



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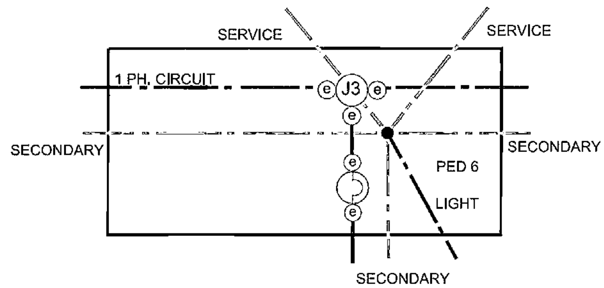
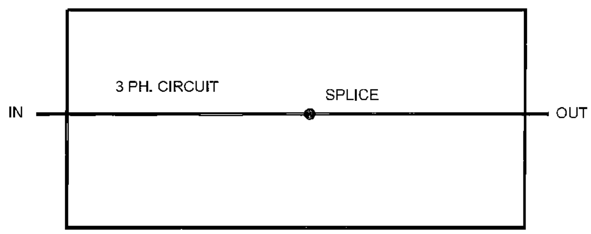
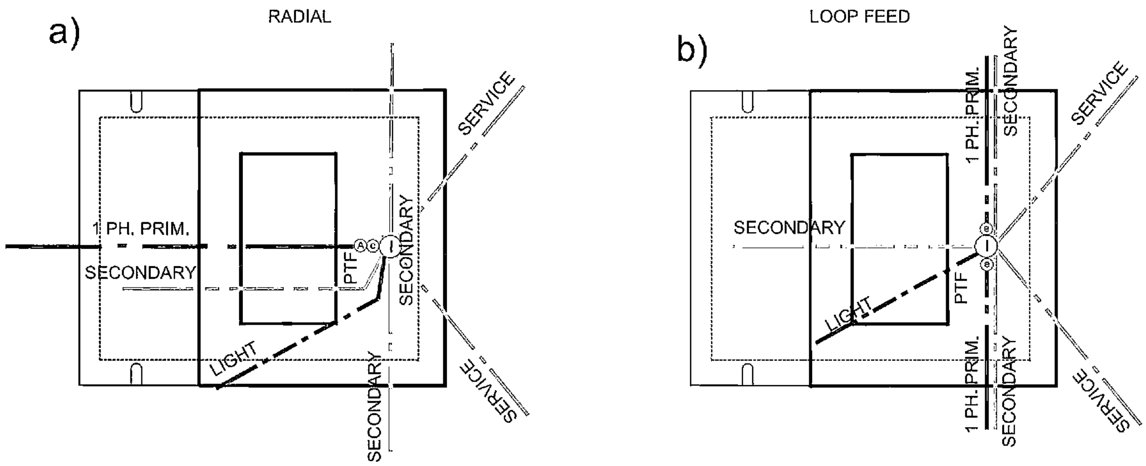


4. <u>Assembly K, (100" Pullbox)</u>
   a) One three phase circuit greater than or equal to 4/0 copper power cable spliced in and out of the pullbox

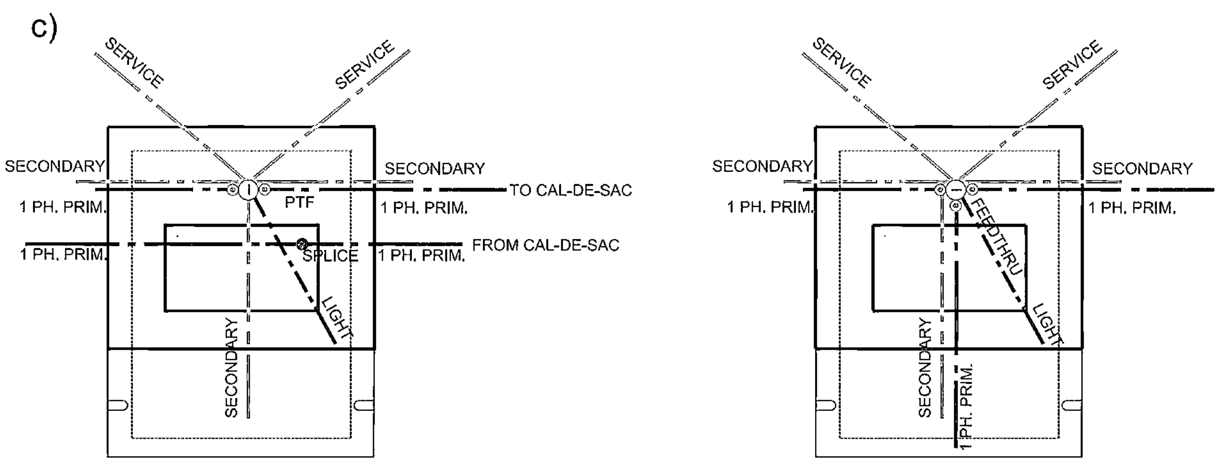


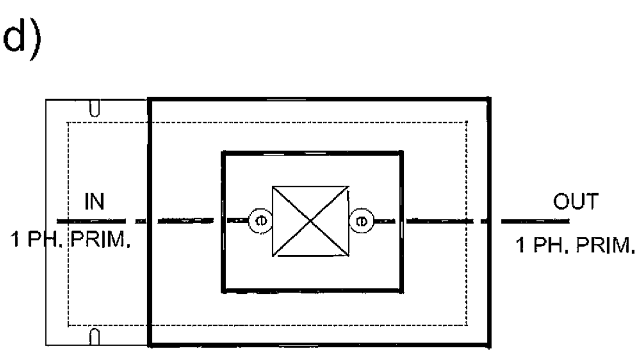
5. Assembly H, (60" pullbox with an E pad and one 20" access lid)
   a) Single phase radial feed circuit to a transformer and from the transformer PTF's, three secondary circuits (up to 350 MCM), two services (up to 4/0) and one streetlight circuit
   b) Single phase loop feed circuit to and from the transformer and, from the transformer PTF's, three secondary circuits (up to 350 MCM), two services (up to 4/0) and one streetlight circuit
   c) Single phase loop feed circuit to and from a transformer with one of the primary circuits feeding into and out of <u>a cul-de-sac and being spliced</u> in the Assembly-H before feeding into the next structure and from the transformer PTF's, three secondary circuits (up to 350 MCM), two services (up to 4/0) and one streetlight circuit. (Feed-Thru bushings can be used on the transformer to facilitate branching the circuit in a lateral direction.)
   d) Single Phase circuit feeding a single phase padmounted switch and then back out.

SINGLE PHASE RADIAL FEED CIRCUIT



SINGLE PHASE LOOP FEED CIRCUIT

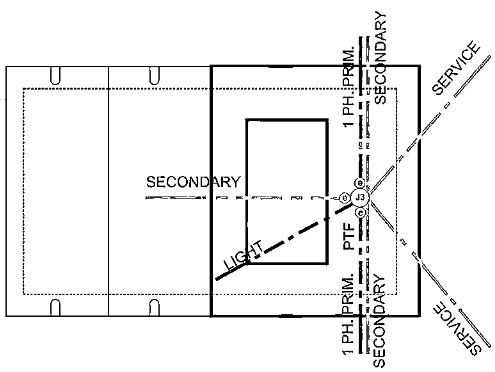




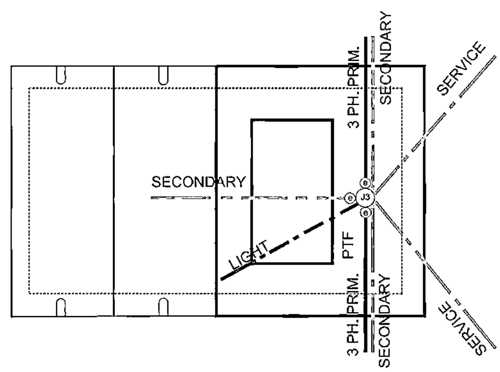
SINGLE PHASE PADMOUNTED SWITCH

6. Assembly E, (80” pullbox with an E Pad and two 20” access lids)
    a. Single phase primary circuit feeding in and out of a transformer and a three-way junction feeding in another direction, and from the transformer PTF’s, three secondary circuits (up to 350 MCM), two services (up to 4/0) and one streetlight circuit
    b. Three phase primary circuit with one phase feeding in and out of a transformer and, on one of the phases, feeding to and from a three-way junction, and from the transformer PTF’s, three secondary circuits (up to 350 MCM), two services (up to 4/0) and one streetlight circuit. (Feed-Thru bushings can be used on the transformer to facilitate branching the circuit in a lateral direction.)

a)

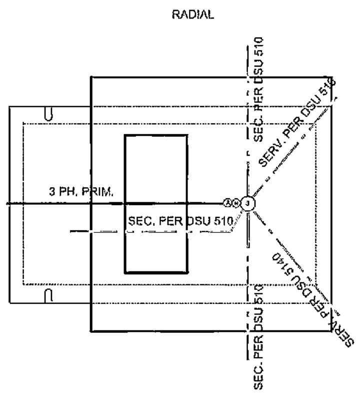


b)

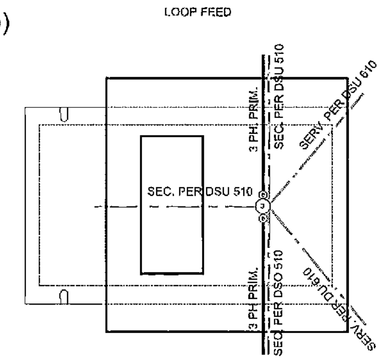


7. Assembly D, (one 80” pullbox with a D Pad)
    a) A three-phase circuit feeding radially into a three-phase transformer, (300 kVA and smaller), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510
    b) A three-phase loop circuit feeding in and out of a three-phase transformer, (300 kVA and smaller), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510
    c) A three-phase circuit feeding into and out of a padmounted switch or other pad mounted equipment

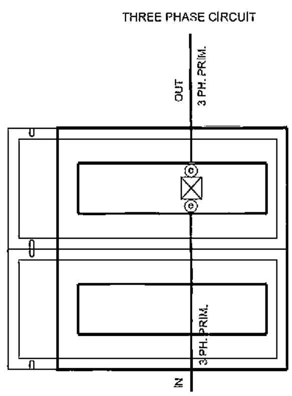
a)

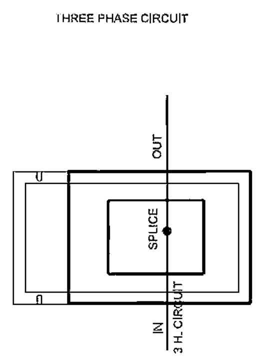


b)



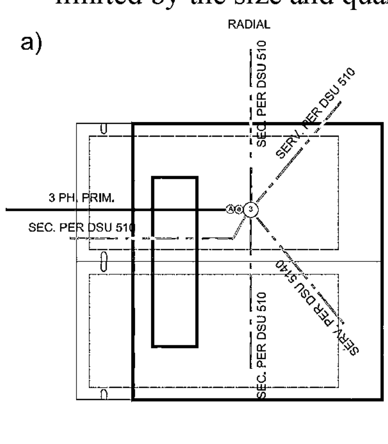
c)



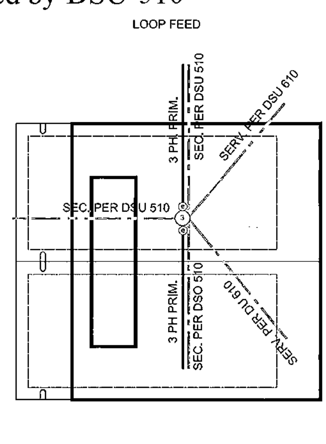


8. Assembly B, (two 80” pullboxes and a B Pad)
   a) A three-phase circuit feeding radially into a three-phase transformer, (500 – 1000 kVA), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510
   b) A three-phase loop circuit feeding in and out of a three-phase transformer, (500 – 1000 kVA), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510

a)



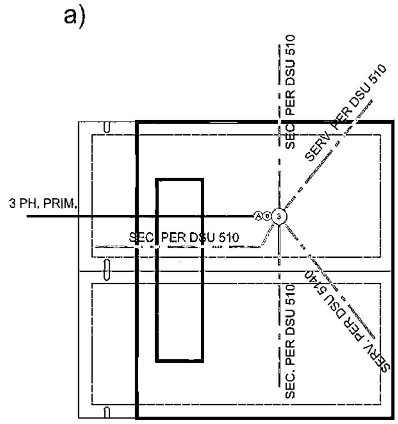
b)



9. Assembly B100, (two 100" pullboxes and a B Pad)
    a) A three-phase circuit feeding radially into a three-phase transformer, (1500 and 2500 kVA), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510
    b) A three-phase loop circuit feeding in and out of a three-phase transformer, (1500 and 2500 kVA), and the associated customer services or EPE secondary limited by the size and quantities indicated by DSU-510

RADIAL

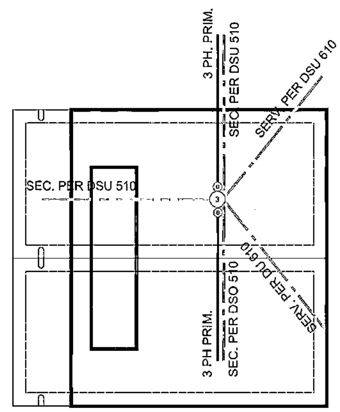
a)



THREE PHASE CIRCUIT

LOOP FEED

b)



THREE PHASE CIRCUIT

VI. Guidelines for Molded Vacuum Interrupters and Fused Elbows

These guidelines apply for Fused Elbow and MVI installations:

1. <u>Fused elbows can be considered for use when;</u>

a. When a circuit to a single-phase load is to be fed from a three phase circuit with predominant three phase load.

And

b. When there is to be a maximum of one transformer with a connected load of less than 15 amps attached to the fused elbow circuit.

And

c. When the underground three phase circuit meets looping criteria.

Or

d. Where the total connected three phase KVA is greater than 1000KVA.

Or

e. When the three-phase circuit has critical load (i.e. schools, hospitals, 911 centers, etc.)

f. <u>The maximum length of the single phase circuit is to be 300 feet.</u>

2. **Molded vacuum interrupters are to be considered for use when;**
   a. When a circuit to a single-phase load is to be fed from a three phase circuit with predominant three phase load.

And

   b. When there is to be at least two and no more than ten single phase transformers with a connected load of less than 50 amps attached to the MVI circuit.

And

   c. When the underground circuit meets looping criteria.

Or

   d. Where the total connected three phase KVA is greater than 1000KVA.

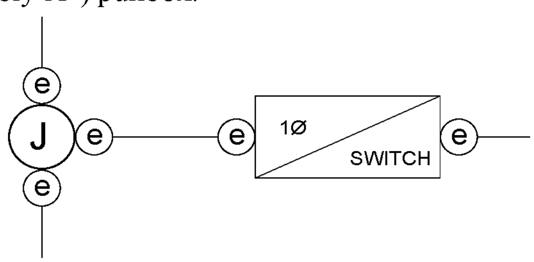
Or

   e. When the three-phase circuit has critical load (i.e. schools, hospitals, 911 centers, etc.)

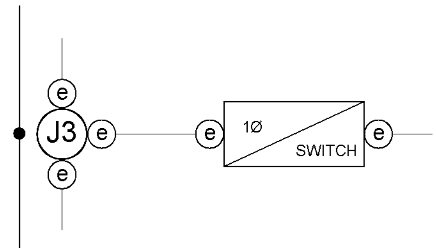
   f. **The maximum length of the single phase circuit or sub-loop shall be 2,500 feet.**

3. **When planning designs for Fused Elbows or Molded Vacuum Switches in existing facilities, inspect the proposed site thoroughly in the field and consult with the underground construction supervisor prior to finalizing the design. Contact Standards Engineering for any further guidance.**

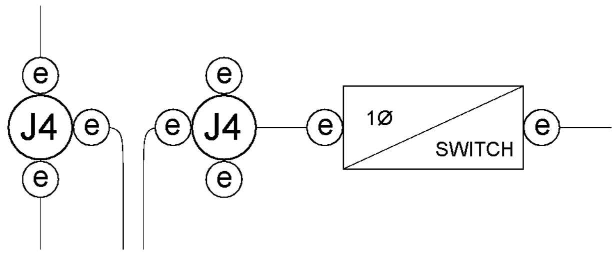
4. **Design Cartography: Add the fused elbow**
   1. Single phase circuit with tap; the switch (MVI) shall be installed on an 80” x 44” (Assembly A”) pullbox.



   2. Two phase circuit with tap; the switch (MVI) and junction (it may be three position junctions J-3) shall be installed in an 80” x 44” (Assembly A”) pullbox.
      a) **Two phase one junction and one splice:**



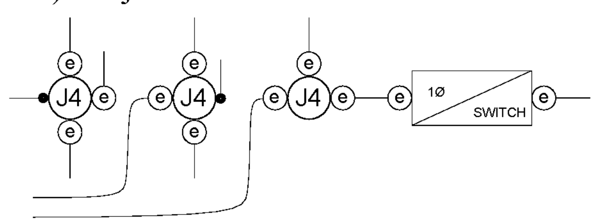
b) Two phase, two- four position junctions:

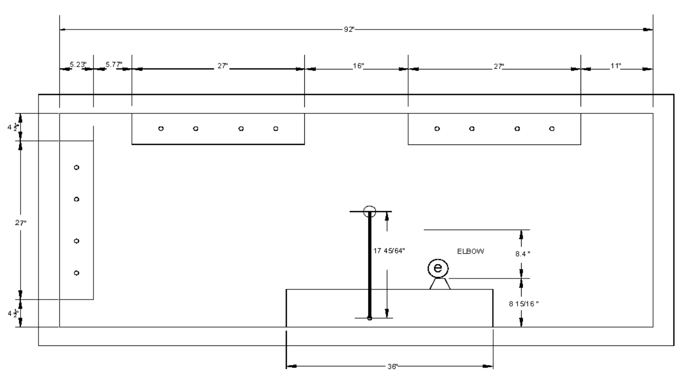


3. Three phase with tap circuit, the switch (MVI) and three 4 way junctions (J-4) shall be installed in a 100" x 44" (Assembly "K") pullbox.

Exception: If splices are installed instead of junctions on other phases, an 80" x 44" (Assembly A) may be installed.

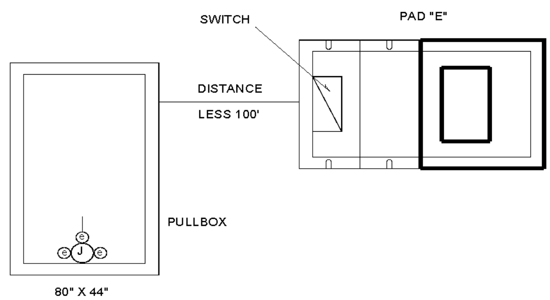
a) Transformers are not to be mounted on the same pullbox where switch (MVI) and junctions are installed.

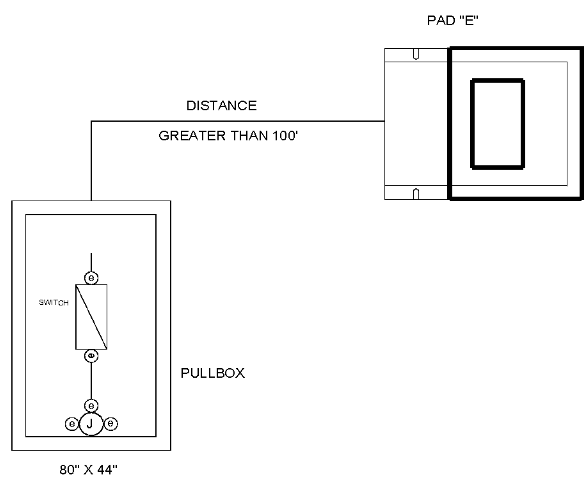




This is for information only: MVI, Junctions and Concrete box dimensions.

b) If distance between Switch (MVI) and transformer is less than 100' the switch shall be installed in the pullbox where the transformer is mounted (Assembly "E"). Junctions shall be installed in an 80" x 44" (Assembly A") pullbox. If distance between pullbox and transformer is more than 100', the Switch (MVI) shall be installed in the same 80" x 44" (Assembly A") pullbox as the junctions.





Demand Diversity as Applied to Transformer Selection and Voltage Drop Calculations

Goal: To gain an understanding of basic diversity concepts. To apply diversity principles toward residential subdivision design, commercial or industrial distribution transformer selection, and amperage calculations used in voltage drop analysis. To understand and apply alternative transformer sizing techniques.

Definitions:

Watts - Measure of power which is the time rate in which work is done, 746 watts is equal to one horsepower.

Volt-Amps - Measure of apparent power, Volt-Amps = (Applied Volts) x (Applied Amps), is the vector sum of watts and vars.

Volt-Amps Reactive - Measure of the reactive component of an electrical load, causes amps to flow but provides no power toward the accomplishment of work.

Demand - "the load at the receiving terminals averaged over a specific interval of time".
Demand can be measured in KW, KVA, KVARS, or Amps.

Peak (Maximum Demand) - "the greatest of all demands which have occurred during the specified period of time".

Demand Interval - "the period over which the demand is averaged".

Diversified Demand - "the demand of the composite group, as a whole, of somewhat unrelated loads over a specific period of time".

Diversity Factor - "the ratio of the individual maximum demands of the various subdivisions of a system to the maximum demand of the whole system".

$$DF = (dl + d2+d3+d_n)/D_{system}$$

Example: A system has 4 connected loads measuring 24, 55, 13, and 76 KVA each.
The measured demand of the system is 210 KVA. Therefore, the diversity factor is equal to:

$$(24 + 55 + 13 + 76) /210 = 0.80 \text{ or, } 80\%$$

Load Diversity - "the difference in the sum of the peaks of two or more individual loads and the peak of the combined load".

Connected Load - "the sum of the continuous ratings of the load-consuming apparatus connected to the system".

Load Factor - "the ratio of the average load over a designated period of time to the peak load occurring on that period".

LF = (Average Load x Time) / (Peak Load x Time), or
LF = (Total KW-Hrs) / (Peak KW x Hrs)

Example: A customer has a peak demand of 100 KW during the month of April. If their energy usage was 45,000 KW-Hrs, what is their load factor?

LF = (45,000) / (100 x 24 x 30) = 0.625 or, 62.5%

Diversity, General Concept:
The basic concept of demand diversification is that the overall demand on a given portion of a system is a function of the total number of attached loads. That is, system demand will usually be less than the sum of the connected peak loads. This diversity will vary depending on the nature of the load. Looking at one extreme, if 20 - 100 watt street lamps are served from one transformer, the diversity is close to unity (1) as the lights will turn on and off at the same time and will require the same amount of power. In residential subdivisions, there is a great deal of opportunity for diversification as individual routines and load types vary from resident to resident.

There are five practical uses for diversity concepts as they relate to Distribution Planners.

1. Residential subdivision design
2. Riser fuse selection
3. Secondary circuit current flow analysis
4. Transformer selection and
5. Feeder load analysis

<u>Case 1 - Residential Subdivision Design</u>

Using the Diversity Tool:
Diversity concepts for residential design should be considered for riser fuse, transformer and secondary conductor sizing. Diversity concepts can be applied to voltage drop analysis calculations as well. The first step is to determine the average peak demand of the homes in the subdivision under consideration. This can be accomplished by using the appropriate diversity curve on the Diversified Demand Chart excel spreadsheet tool. But, first, we need to know some information about the homes that are to be constructed in the subdivision.

Although there are many variables that contribute to the ultimate demand of a given residence, the average size of the proposed homes is probably the best average indicator of expected demand. By analyzing the average lot size in the development and by contacting the developer or builders about the expected size of homes within the development, a Planner can obtain this information. Additionally, other information, such as whether the homes will be all electric, have electric water heaters, electric ranges or refrigerated air conditioning, can also be obtained by builders that are expected to construct in the subdivision.

The Diversified Demand Chart tool referred to above enables the entry of the listed variables to calculate results for a given circuit segment. Refer to the instructions below.

This chart is to be used with homogenous (similar load types) loads only! When used properly, the chart will provide a means of estimating the demand kVA for transformers, line segments, and fuses based upon 1) the square footage of the average home within a development, 2) whether the homes are considered "all electric", 3) the expected refrigerated air conditioning tonnage, and 4) any other known electrical load.

Cells highlighted in light blue are the data input cells. Each of these cells except for B21 (Number of Loads) have a valid list of domain values through a drop down list. Select the value that most closely matches the design parameter from each of the drop down options. Below is a description of the required input to the spreadsheet:

1. Square Footage: This is cell contains a coded domain list of the estimated average area, in square feet, of the residences in the study area. KVA load is calculated based upon an estimated KVA demand per the residence input square footage **(a Power Factor of 85% is assumed for these calculations)**. If better load information can be acquired than this Square Footage estimation, select zero from the drop-down list and enter the more accurate load data in the Other Loads cell, C10.
2. All Electric: There is a coded domain value of Yes and No for this cell. If Yes is selected, a factor of 20% will be added to the Square Footage value calculated above in KVA Load cell C7. The Yes value is to be used if the residences have electric water heating and electric kitchen appliances.
3. Refrigerated Air: There is a coded domain value of Yes and No for this cell also. If Yes is selected, the KVA Load for each refrigerated air conditioning listed in cells B14 through B18 will be added to the KVA Load cell C9.
4. Other Loads: Enter other identifiable electrical loads, (in KVA), that will likely be utilized throughout the residential development under study. If better load information can be acquired than the Square Footage estimation above, enter that load data here, (set square footage to zero).

5. Refrigerated Air Units: Enter the size of each refrigerated air conditioning unit from the drop-down list provided. Up to five individual units may be specified.
6. Number of Loads: This value should reflect all residences that contribute to the current flow through section of the circuit under analysis. For transformer analysis Number of Loads will be the number of individual customer loads to be connected to the transformer being studied. Likewise, for line segment and fuse current analysis include the total number of residences in the study area that will cause current to flow. This can be done separately for both normal and emergency operating conditions.
7. Load Voltage: There are three options on the drop-down list for this entry. 1) Select .24 when the analysis concerns transformer or secondary line segment loads. 2) Select 7.97 when the analysis concerns line fuse or primary line segment loads on 13.8 kV feeders. 3) Select 13.8 when the analysis concerns line fuse or primary line segment loads on 23.9 kV feeders. (Refer to example below)

	Value	KVA Load
Square Footage	2250	10.13
All Electric?	No	10.13
Refer Air?	No	0
Other Loads		0
Total Load (KVA)		10.13

Refrigerated Air Units	Size	KVA Load
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
		0

Number of Loads	10	
	3	51.65%
	Total Load (kVA)	52.29
		Load Amps
Load Voltage = (kV)	0.240	217.88

This tool can be used to determine riser fuse size, primary and/or secondary conductor size, and transformer size. **If actual load documentation can be acquired, use that information instead of the Square Footage estimation and enter it in the Other Loads cell.**

Should you acquire more detailed load information about homes in a given subdivision, use that information in lieu of the general rules listed above. If average home size information is unavailable, use lot size as a general guide. Lots with less than a 60 foot front are likely to correspond to homes less than 1200 square feet, (< 10 kVA Curve).

Similarly, for average lot fronts between 60 and 100 feet use the 10 – 30 kVA Curve; and for 100 to 150 feet fronts, use the > 30 kVA Curve. Lots larger than this may have virtually any size of home, (mobile home to mansion). Check with any covenants that the development may have for home size restrictions and take care in noting slopes that may occupy a large square footage percentage of the lot.

Riser fuse/cutout sizing:

The first consideration in sizing any fuse should be fault current coordination. The next consideration should be the load that the fuse, and cut-out, are expected to serve. After selecting the appropriate diversity curve and determining the maximum number of lots that the riser fuse will feed, the diversified demand can be calculated.

Example: A 200 lot subdivision served from two risers is being designed on a 13.8KV feeder.

If the average home size for this development is 2250 square feet, the Diversified Demand Chart tool will select the 10 – 30 kVA curve to calculate load based upon square footage. In this scenario, there will be no refrigerated air conditioning or other load. This results in an estimated value of peak load of 10.13 kVA per home.

Since it is possible that either riser could carry the entire load of the development, each riser fuse must be sized to accommodate all load that the 200 lots generate. So, the Total Loads value must be set to 200. This results in a total diversified of:

10.13 x 200 x .35 (provided by the Diversified Demand Chart tool) = 708.75 KVA

From this the diversified current of each riser under full load will be;

708.75 KVA/ 7.97KV = 88.93 amps

Therefore, a 100 amp cutout is adequate and a fuse capable of handling 89 amps of continuous current is needed. Above 100 amps, the load will need to be segmented further, (by phase distribution or additional feed points), or the Distribution Systems Engineering group will need to be contacted.

Residential Transformer Sizing:

A similar procedure to that used for riser fuse and cutout sizing can be applied to sizing transformers in a residential subdivision. The new residential design standard indicates a maximum of 12 lots served per transformer in underground residential subdivisions. So, if in this design it is desired to serve 12 customers from a single transformer, the Diversified Demand Chart Tool can help with the selection of the proper transformer size. If the Number of Loads value is changed to 12, the tool indicates that the total diversified load is 58.1 kVA. So, a 75 KVA transformer is an appropriate selection.

It should be remembered that if the Diversity Curve changes or if the number of residences served by a given transformer changes, a separate analysis is needed to determine the transformer size. Also, keep in mind other factors such as voltage regulation or flicker may affect the ultimate transformer size needed.

Voltage Regulation:

Once again there is much similarity in the way diversity is used when calculating load currents in a voltage regulation problem. The methodology as it relates to diversity will only be described here as a later section will explain the mechanics of voltage regulation calculations. The main difference between Voltage Regulation diversity and those previously described is that an iterative process is needed with Voltage Regulation as the number of loads connected to the network under investigation changes as the problem moves toward the solution.

Example: Assuming that the transformer discussed above has secondary cable extending from the transformer in two directions, (each serving 4 customers), a secondary cable run across the street to serve two residences, and two residences served directly from the transformer. Typically, our Voltage Regulation analysis would be focused on one of the secondary cable runs that serve the four customers that have the longest linear distance from the transformer. So, select the cable run serving four customers that are most distal from the transformer. After changing the Number of Customers input to 4, the Diversified Demand Chart Tool calculates a load current of 119.62 amps for the four customers. Use this value, the cable impedance, and the linear distance of the cable to calculate the voltage drop through that cable segment. Similarly, repeat the sequence (changing the Number of Loads to 2) for the next two customers (72.09 amps), and finally, the current for the service run to the last customer (changing the Number of Loads to 1), providing a load current of 42.19 amps.

Case 2 - Commercial or Industrial Transformer Selection

There are three techniques that can be used to determine transformer sizing for commercial or industrial customers.

1) Probably the best method is to use historical data from exact or similar installations. For example, if a new McDonalds is proposed, look up the demand history from other McDonalds already in service on the Company CIS. Find a recent installation and that had already been through at least one summer season. Make sure that the proposed unit will be similarly constructed, (square footage, air conditioning, etc.), to the unit from which you are obtaining information. If the customer you are obtaining load history from has a recording meter, make sure you obtain KVA readings. If they do not have a recording meter, then a power factor estimate will be needed. Depending on the type of equipment that the customer has, power factor estimates should be between 75 to 90%. It is recommended that a power factor of 88% be used for "typical" commercial customers.

2) Another good method is using customer load data from panel schedules or riser diagrams. This can be more of an art than a science but there are certain "common sense" things to look for. The first is to separate the heating from the air conditioning load. Use the larger of the two and make sure that the other is not added to the total connected load. Also, check to see if the engineer included the 25% overload of the largest motor. This is to assure that the internal wiring can accommodate motor start-up current, but it is transient. For transformer loading considerations, this is negligible (**please keep in mind that voltage flickers may be a problem, flicker calculations will be provided in another paper**). Try to group loads into like types (lighting with lighting, outlets with outlets, etc.). Once this is accomplished, individual diversity factors can be applied to each of these load groupings. These diversity factors will vary depending on the nature of the business. For example, the motor load diversity factor of a 5 employee job shop with ten different motor driven tools will be quite different from a 10 pump PSB pumping station that lists only one unit as an emergency back-up. Try to obtain as much specific information about the new load as is practical so that you may have a better feel for diversity factor estimation. As a **general** guide, listed below are diversity factors that can be used for load groups. Keep in mind that these diversity factors vary with the number of loads within a given load grouping as well as with the type of load. Also, this list is published without any specific knowledge of a given customer's load.

Diversity Factors	
Outlets	15%
Lighting, (intemal)	70%
Lighting, (external)	0% if peak is expected during day, 90% if at night
Air Conditioning	80% if larger than heating else 0%
Heating	80% if larger than air conditioning else 0%
Motors	75% to 30%, if many lean to 30% if few toward 75%
Chillers	75% to 30%, if many lean to 30% if few toward 75%
Special Equipment	80% to 50%, if many lean to 50% if few toward 80%
Miscellaneous	10%
Spare	0%

The final expected demand should be in the range of 40 to 60% of connected load depending on the nature of the business.

When obtaining panel schedule loads, note the units that are used to derive the total connected load. Usually the units will be in amperes as the engineer is concerned with sizing conductors and breakers. If load is listed in amperes, it will not be necessary to apply a power factor to the Volts times Amps times Square Root of three calculations as the result is already in kVA.

3) Sometimes, especially with smaller commercial customers, only connected load or main panel size information is given. There is no opportunity to diversify load since individual loads have been combined or are unknown at that time. If there are no similar customers to compare load with, a percentage of connected load or panel size should be used. Typically, these percentages will fall between 40 and 60% of connected load or panel size. A range of 45 to 50% usually will cover most of these customers (When panel size information is the sole information source, lean toward the lower percentages listed).

4) Strip shopping center loads are often presented in this manner as tenant load information may not yet be available. In this scenario, remember that the transformer is going to serve more than one customer, usually through a main panel and a metered gutter. So, not only do you have in individual load diversity, you have diversity among the customer base as well. Also, the shopping center may not be 100% occupied providing further opportunity to reduce the estimated demand.

5) Pumps are another common load that Planners encounter. As a rule of thumb, the pump motor horsepower corresponds directly with KVA. However, keep in mind that the horsepower rating of the pump motor is the maximum load that the motor can accommodate on a constant basis. Most engineers will not design a system so finely that the work needed is exactly equal to the motor's horsepower rating. A recommended guideline for these loads would be between 60 to 80% of the motor's nameplate rating. So, a 100 horsepower motor would have an estimated demand of between 60 to 80 KVA.

It should be remembered that decisions concerning transformer size selection is an economic decision. Design considerations have been provided in this paper, but they will not guarantee that some percentage of the time a transformer will be undersized and have to be changed. It is not the intent of this paper to design for anomalies. Anomalies can be discovered by researching the customer thoroughly to determine specific load profiles. The guidelines provided will provide accurate transformer sizing the vast majority of the time but will miss some anomalies. It is important that the Planner not "play it safe" by substituting anomaly designs for sound customer load analysis as this will cause the Company to bear excess transformer costs, (initial price and additional transformer loss cost).

Finally, the guideline for maximum load percentage on a given transformer should be discussed. In general, underground transformers should not be loaded beyond their nameplate rating, (100%). Overhead transformers can be loaded to 130% of their nameplate rating. An issue to consider when selecting a transformer size is load factor. Load factor is a measure of the percentage of time that a load is near or at peak demand) over the period of study. Load factors above 75% indicate that there probably is not much difference between the peak and lowest demand. In any event, the transformer will not have much opportunity to cool. If the estimated demand is at borderline between two transformer sizes, select the larger unit. Conversely, if load factor is less than 30%, choose the smaller unit.

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QUESTION NOS. OPUC 13-1 THROUGH OPUC 13-17

OPUC 13-12:

Please refer to the Rebuttal Testimony of Mr. Hernandez at 19:7 - 15. Is it Mr. Hernandez's opinion that the residential customers who pay their EPE electric bills are more responsible for 904 – Uncollectible Accounts Expense to be incurred than customers in other customer classes who also pay their EPE electric bills? If so, please provide a detailed explanation for your response.

RESPONSE:

No.

Preparer: Adrian Hernandez Title: Senior Rate Analyst – Rates

Sponsor: Adrian Hernandez Title: Senior Rate Analyst – Rates

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OPUC 13-13:

Please refer to the Rebuttal Testimony of Mr. Manuel Carrasco at 17:10 – 16. Is it Mr. Carrasco's testimony that any of the analyses EPE mentioned in response to OPUC 7-8 identifies the level of impact by usage of block frequency or by number of customers by impact percentage for EPE's total Texas residential customers?

RESPONSE:

No.

Preparer: Manuel Carrasco Title: Manager – Rate Research

Sponsor: Manuel Carrasco Title: Manager – Rate Research

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OPUC 13-14:

Please refer to the Rebuttal Testimony of Mr. Carrasco at 17:10 – 16. Please provide a detailed explanation how each of the three summary analyses EPE listed in response to OPUC 7-8 specifically identifies or evaluates the impact of the following changes on EPE's residential customers by block frequency or by numbers of customers:

a. proposed change in the definition of summer season;
b. proposed increase in the seasonal price differential;
c. proposed increase in the price differential between the first and second energy blocks for summer for the Residential Service rate; and
d. the combination of the changes identified in a, b, and c.

RESPONSE:

None of the three summary analyses El Paso Electric Company ("EPE") listed in response to OPUC 7-8 specifically identifies or evaluates the impact of the listed changes on EPE's residential customers by block frequency or by number of customers.

Preparer: Manuel Carrasco Title: Manager – Rate Research

Sponsor: Manuel Carrasco Title: Manager – Rate Research

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OPUC 13-15:

Please refer to the Rebuttal Testimony of Ms. Cynthia S. Prieto, Exhibit CSP-2R, page 3. Please confirm or deny that the 2021 updated actuarial estimates shown on Exhibit CSP-2R, page 3 for the Retirement Income Plan ("RIP"), the Excess Benefit Plan, the Other Postemployment Benefit Plan ("OPEB") and the combination of the Supplemental Retirement and Survivor Income Plan, the Executive Retirement Agreements, and Directors' Retirement Plan ("SERP") were included in the 45-Day Update as actuarially determined costs for 2021. If confirm, please provide the reference in the 45-Day Update to the actuarial amounts reported on Exhibit CSP-2R, page 3. If deny, please provide a reconciliation between the 2021 actuarial amounts included in the 45-day Update to those shown on Exhibit CSP-2R, page 3. Please include an explanation for the differences in amounts reported for 2021 in the 45-Day Update and Ms. Prieto's Rebuttal Testimony.

RESPONSE:

Deny. The pension expense per GAAP amount included in the 45-day Update on Schedule G-2.1, page 2 for January to March 2021 represents three months of the pension costs included in the original filing in WP A-3, Adjustment No. 4, - Pensions and Benefits on page 3 in excel cell D47. The final pension and benefit expense for 2021 was received in August 2021 after the finalization of the census data for the plans. Please refer to OPUC 13-15, Attachment 1, for a reconciliation between the 2021 benefit expense amounts included in the original filing to those shown on Exhibit CSP-2R, page 3.

Preparer: Karen Baca — Title: Senior Technical Accountant

Sponsor: Cynthia S. Prieto — Title: Vice President – Controller

Line No.		(a)	(b)	(c)	(d)	(e)
		For the twelve months ended December 31, 2021				
		RIP	Excess	SERP	OPEB	Total
1	Actuarially determined estimated Net Periodic Benefit Cost (gross) (1)	3,606,742	977,872	1,011,637	(5,914,588)	(318,337)
	Less:					
2	Service Cost	12,158,445	284,087	-	3,165,476	15,608,008
3	Capitalization Rate	25.54%	25.54%	25.54%	25.54%	25.54%
4	Capitalization of Service Cost component	3,105,267	72,556	-	808,463	3,986,285
5	**Pension and Benefit Expense WP A-3, Adjustment No. 4, page 3**	501,475	905,316	1,011,637	(6,723,051)	**(4,304,623)**
6	Actuarially determined final Net Periodic Benefit Cost (gross)	4,484,232	1,045,465	1,011,637	(5,441,233)	1,100,101
	Less:					
7	Service Cost	12,701,901	234,653	-	3,498,330	16,434,884
8	Capitalization Rate	25.54%	25.54%	25.54%	25.54%	25.54%
9	Capitalization of Service Cost component	3,244,066	59,930	-	893,473	4,197,469
10	**Pension and Benefit Expense Rebuttal Testimony of Ms. Prieto, Exhibit CSP-2R, page 3 (2)**	1,240,166	985,535	1,011,637	(6,334,706)	**(3,097,368)**
					Increased benefit expense	**(1,207,255)**

(1) The amount included in the 45-day Update on Schedule G-2.1, page 2, represents three months of this amount ($3,606,742 / 4 = $901,686).

(2) Updated with final actuarial report received on August 13, 2021, after filing the 45-day update. The actuarially determined net periodic benefit cost for all benefit plans is revised once the final census data is finalized, usually between July and August of each year.

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OPUC 13-16:

Please refer to the Rebuttal Testimony of Ms. Prieto, page 4, lines 13-16. Please confirm or deny that requested costs for retirement plans (including RIP, Excess Benefits, SERP and OPEB) as filed by the Company included an adjustment to reflect the actuarially determined expense for 2021. If deny, please explain the Rebuttal testimony on page 4, lines 13-16. If confirm, provide an explanation as to why the Company is now requesting an increase to these actuarially determined costs for 2021.

RESPONSE:

Confirm. The actuarially determined expense of the benefit plans is estimated annually in January for that calendar year. El Paso Electric Company ("EPE") works with its actuary to update the census data during the first half of each year and the actuary finalizes the annual benefit plan expense in the third quarter of each year. EPE received the final benefit expense amounts for 2021 in August 2021 and included those known and measurable amounts in the Rebuttal Testimony of EPE witness Cynthia S. Prieto.

Preparer: Karen Baca — Title: Senior Technical Accountant

Sponsor: Cynthia S. Prieto — Title: Vice President – Controller

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OPUC 13-17:

Please refer to the Rebuttal Testimony of Ms. Prieto, page 18. Please provide a complete copy of each of the actuarial studies for all four benefit plans.

RESPONSE:

Please refer to El Paso Electric Company's response to OPUC 12-1, Attachment 1, for a copy of the final actuarial studies for all four benefit plans, which include the final gross net periodic benefit cost for each plan.

Preparer: Karen Baca   Title: Senior Technical Accountant

Sponsor: Cynthia S. Prieto   Title: Vice President – Controller

The following files are not convertible:

OPUC 13-15_Attachment 1.xlsx

Please see the ZIP file for this Filing on the PUC Interchange in order to access these files.

Contact centralrecords@puc.texas.gov if you have any questions.