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#### INTRODUCTION

In recent years, Gulf Power has received numerous requests for information about and/or assistance with the underground installation of electric utilities. Gulf Power provides an array of construction options which allows developers more flexibility in budgeting and scheduling their projects.

Gulf Power designs underground systems using a complete duct system with electrical grade, Schedule 40 PVC duct as our standard. This duct provides the underground conductor with a good level of mechanical protection and also provides for future access for maintenance and additional installations.

This booklet is designed as an information tool for developers of large projects and subdivisions who wish to install the duct system for electric distribution facilities underground.

While every effort was made to make this booklet all-inclusive, we ask that you consult your Gulf Power Engineering representative if you have any questions as information in this document is subject to change.

As with any underground construction project, existing utilities must be spotted or located to prevent damage or injury. On large projects such as subdivisions, apartment complexes, condominiums, hospitals or any large businesses, adequate lead time is needed for Gulf Power Engineering to properly design your system and order materials. Coordination among Gulf Power personnel for scheduling work, securing easements and obtaining inspections is vital. (Payment of bills and signed work contracts are required up front.) Following the processes outlined in this book will help ensure a safe and properly installed electrical system built on time and to your satisfaction.

### THE STEP-BY-STEP PROCESS

The following is a step-by-step process for creating, organizing and constructing the duct system in subdivisions and commercial projects using an underground electricity supply.

- 1. Contacting your local Gulf Power Marketing team representative sets the wheels in motion. This team member will notify Engineering, the underground coordinator and the area planner/scheduler of the upcoming project.
- 2. The Marketing representative will arrange a pre-estimate meeting with Engineering and the developer, usually at the job site. This gives the engineering staff an opportunity to meet the developer and assess the terrain for conditions such as bridge crossings, creeks, unusually wet locations, beach sand or steep terrain. The information will be used in designing the project and advising Gulf Power crews of any unique equipment that may be required.



Non-typical construction due to bridge crossing.

- 3. A check sheet covering important items will be completed by Gulf Power Engineering and discussed with the developer.
- 4. A copy of the plat with the legal description will be required at this time. If your project has been designed on AutoCAD, please be sure to supply our Engineering Department with a copy of your project on CD. The final plat or recorded plat should be used. If the project layout is altered in any way (change in lot lines, grades or quantity of lots, etc.) after the original agreed upon design has been completed by Gulf Power, the developer will be responsible for reengineering fees.



Non-typical construction due to beach conditions.

# Subdivision Pricing Options

Aud underground exhibits detailing construction with the subdivision developer. If the terrain, loads and/or equipment are typical, the current flat rate pricing will apply. Non-typical projects must be designed before a differential cost (underground cost less overhead equivalent cost) can be quoted.

There are three pricing options available to developers for subdivisions.

- 1. Gulf Power supplies and installs all primary, secondary, and service trench, duct, and cable.
- 2. The developer installs the primary and secondary trench and duct system. Gulf Power supplies primary and secondary duct and supplies, and installs service duct.

Gulf Power supplies and installs primary, secondary and service cable.

3. The developer supplies and installs the primary and secondary trench and duct. Gulf Power supplies primary and secondary cable. Gulf Power supplies and installs service duct and cable.

Where a three-phase system (120/240V, 120/208V or 277/480V) is required for commercial loads that include a five (5) horsepower or larger motor (such as a lift station) within a subdivision, additional costs will be included in the contribution by the developer for the three-phase load.

If the customer does not choose an option to purchase his own duct, then duct may be obtained from Gulf Power. A duct order form must be completed by the area Engineering representative. The original form must be presented to the respective warehousing facility in each district. The area Engineering representative can provide details for each location. An example of this form is located on Page 23.

# Large Commercial Projects Pricing Options (Apartments, Condominiums, Malls, Light Industrial, General Commercial)

Typically, the underground cost for these projects is calculated using the differential between the standard overhead construction designed to serve the project and the underground design. In some cases, if the load exceeds a specified amount, a pad-mounted transformer may be provided free of charge. In cases where five or more residential dwellings are under one roof, the multi-family dwellings will qualify for free underground single-phase or three-phase (depending on the three-phase loads) service at Gulf Power's specified point of attachment if full use of the tract of land is made. The developer may want to participate in the construction process as outlined in the three subdivision options to save time or reduce construction cost.

#### Easements

The developer must provide a legal description of the project. In order to construct and energize electrical distribution systems, and provide access for future maintenance, Gulf Power must secure an easement on the portion of land occupied by company facilities. Depending on the application, the easement can be

secured as a "blanket" over the entire described property; "subdivision," describing the access from the given rights-of-way, or "strip," which is an area agreed upon by both parties and described by the developer's surveyor. Gulf Power's Land Department will work with developers on each construction project. Survey descriptions of "strip" easements, if desired, are the responsibility of the property owner or developer.

# Letter of Agreement

nce the legal description is received, the developer will be provided with a Letter of Agreement spelling out the options for construction. After the selection is made, the Letter of Agreement must be forwarded to the Marketing representative who will schedule the project for design with Engineering. Often Gulf Power must first design non-typical projects prior to a letter of agreement so the developer can make an informed option decision with price as a consideration.

# Engineering Designs Your Project

Engineering will prepare a master design of the underground system. If an option has been chosen making the developer responsible for the duct installation, Engineering will send the developer a copy of the design for the purpose of obtaining bids for construction. Duct installation must not begin on the project until the developer has consulted with Engineering and received an approved duct design layout. Coordination with Gulf Power is required for field inspection of the open trenches relative to correct termination of duct, installation of tracer wire, depth and separation from other utilities.

# Marketing Delivers Your Contract

Marketing will prepare the contract, final exhibits, tariff attachments and agreement for underground construction standards for the developer to sign. At this point, Marketing will require payment from the developer.

# Pre-Construction Meeting

Onstruction of the duct system shall not be started until a pre-construction meeting is held with Engineering, the Underground Inspection Team Member, the developer and the successful contractor (if the developer is participating in the construction process) to confirm construction details and inspection points. This communication meeting will prevent most construction and coordination problems, and will be held on-site. Coordination with other utilities and spotting of any pre-existing facilities is mandatory.

#### As the Shovel Turns

After all the discussions, planning and paperwork have been completed, it is time to start digging. Following is a list of requirements, drawings, comments, hints and photographs to assist in the successful and on time completion of the project.

# Inspection of Customer Trenching/Duct Systems

As part of the pricing options for subdivisions or to reduce costs in commercial developments, the developer may elect to be responsible for installing the duct system. If the developer or contractor installs the duct, Gulf Power will inspect the installation for compliance.

Routine inspection items include:

- ensuring that correct material is being used
- checking for level trench
- checking condition of duct
- measuring for proper depth after final grade
- measuring for proper separation from other utilities
- ensuring proper location of stub-ups relative to permanent markers for property lines and rights-of-way (Note: Relocation of duct stub-ups at incorrectly marked property lines is solely the responsibility of the developer.)
- measuring height of stub-ups
- verifying duct continuity and proper location using a mandrel-blowing process
- installation of tracer wire.



Underground inspector checking for proper depth and level trench.

# **Duct Ownership**

If the developer chooses to purchase the duct, Gulf Power will take ownership of the duct at the time the cable is pulled in the duct. If the developer chooses to install Gulf Power's duct, then Gulf Power will be responsible for the duct system only after all inspections are completed and the developer has blown a mandrel through each duct to verify proper installation. Until Gulf Power takes ownership of the duct, the developer is responsible for accessing and repairing any damaged duct.

# TYPICAL UNDERGROUND UTILITY LOCATIONS

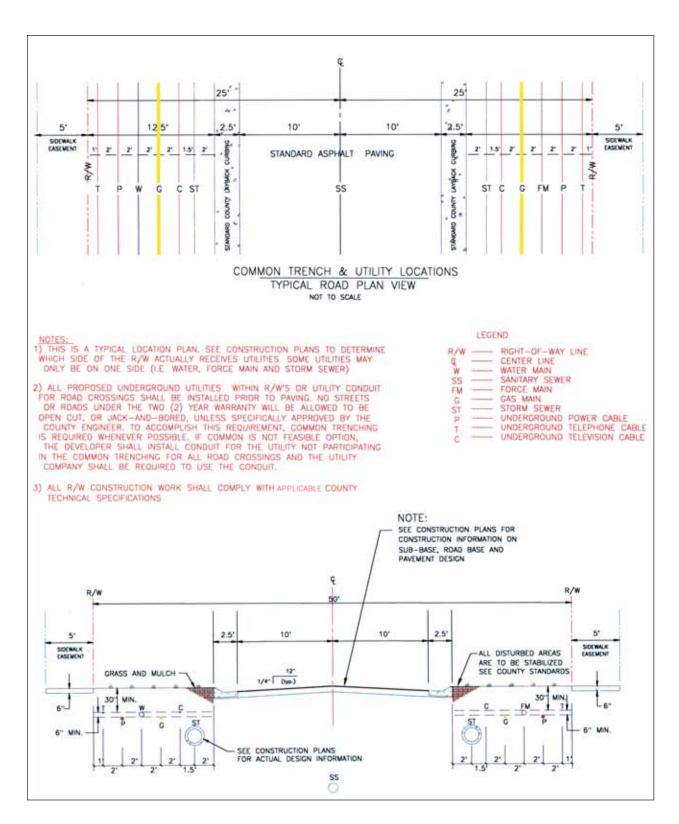
The drawing on Page 8 has been adopted by most major utilities and municipalities in Northwest Florida as the standard installation method for underground utilities. This method provides a consistent corridor for all to follow and should reduce or prevent the number of "cuts" associated with underground utilities. The National Electrical Safety Code limitations on proximity from Gulf Power's conductors to other utilities are a minimum of 12 inches of separation vertically and horizontally.

Fire hydrants and flushing hydrants cannot be placed closer than 5 feet to Gulf Power secondary pedestals, transformer pads or distribution or lighting poles. Gulf Power has, throughout the years, found developers willing to comply with these requirements. History shows it is easier (and less expensive) to adjust the hydrant locations in the field rather than redesign the electrical distribution if there is a location conflict.

Water taps also should be no closer than 5 feet left or right from the property line. This allows the electrical transformer or secondary pedestal to be placed within one (1) foot of the property pin and conductors to be routed to the customers on their respective property. Cable television and phone pedestals may be within 6 feet of Gulf Power facilities if properly bonded or grounded to our equipment.



Joint trench showing proper 12" minimum separation between water and power.



Typical road cross section

# CONSTRUCTION HINTS AND OTHER POINTS TO CONSIDER

August Power representative will inspect all trenches to ensure they are level, uniform and at the proper depth. The power conductors will not pull through duct that is wavy, either up or down or left to right, due to the additional friction incurred.

Plywood templates of transformer pads and secondary pedestals showing the duct windows are extremely useful for correctly forming and gluing the ductwork. This practice also cuts installation time. Duct pattern sheets may be obtained from the area Gulf Power Engineering representative. The underground coordinator can answer any questions that should arise in the field about proper duct orientation.

All stub-ups must be temporarily capped with vinyl caps obtained from the duct supplier. They are either red or black in color and keep the duct free of dirt and debris.



The use of plywood templates ensures correct and rapid duct installations.

It is recommended that the developer obtain and install transformer pads at the time of duct installation to protect duct stub-ups and to ensure that the duct stub-ups fit correctly in the pad window. The use of plywood templates ensures correct duct installations. The practice of installing the transformer pads helps identify the location of the stub-ups and reduces stub-up breakage or

damage from mowers or wheeled vehicles.

Gulf Power requests that a distance of 5 feet be maintained between the green padmounted transformers, or switch cans, and shrubbery so the electrical equipment can receive airflow to aid in cooling under full, designed loading. Additionally, in the event of equipment failure, damage by cars or lightning, the crews dispatched to replace or repair the equipment can do so in a safe and expedient manner.



Duct shown at correct height in transformer pad with vinyl protective caps installed.

# SERVICES FROM THE ROAD TO THE RESIDENCE

Gulf Power offers a similar publication, *GOING UNDERGROUND*, *The Real Scoop*, that addresses the complete service procedure. This document is available through both Gulf Power Marketing and Engineering Departments.

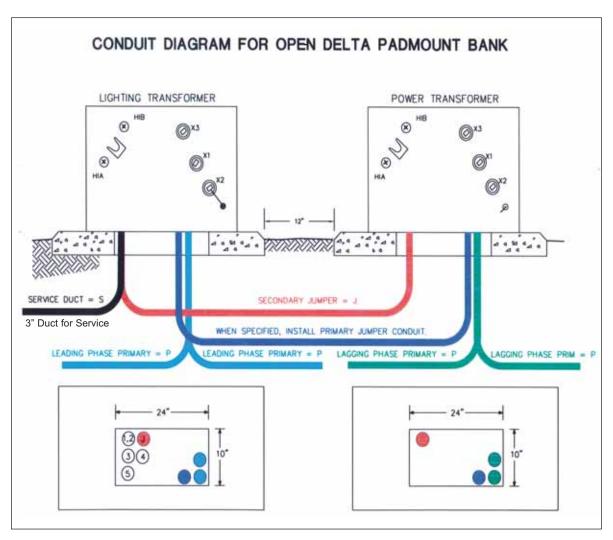


#### THREE-PHASE FACILITIES

Three-phase open-delta banks operating at 120/240 secondary voltage or three phase wye banks operating at 120/208 or 277/480 secondary voltage may be required for lift stations. The following pictures and schematics outline the proper installation of these type facilities.

Important points to consider are:

- A minimum 12-inch separation is required between transformer pads. This can be accomplished by gluing two 90-degree duct elbows together for each of the duct runs between the two transformers.
- 3-inch I.D. duct is required for the quadraplex service to the three-phase load. The quadraplex service will not fit in standard 2-inch I.D. duct.



See page 16 for legend.



Duct layout for 120/240 secondary voltage open-delta bank.





### LIGHTING

Developers often request information regarding lighting streets, parking lots and parks for safety, security and aesthetic appeal.

It is important to remember that lighting circuits are installed in conduit just like the other conductors in our system. This provides quick and easy maintenance, with little or no digging, if a problem should arise. Standard, electrical grade, Schedule-40 PVC (2-inch) duct shall be run for circuits from secondary pedestals or transformers to the light poles. Most lighting is placed at the transformers or secondary pedestals. This requires only a single 90-degree, 36-inch duct sweep out of the cabinet to the fixture.



Fluted green decorative concrete pole with acorn style lighting fixture.

If lighting is being considered, the developer should include the lighting duct system in conjunction with installation of the power ducts. Several lighting fixtures and different types and height poles are available for installation. Each fixture offers a different lighting pattern, and decorative concrete poles can create an aesthetic appeal for any application. Gulf Power Marketing and Engineering representatives can provide a complete listing of lighting and pole choices.



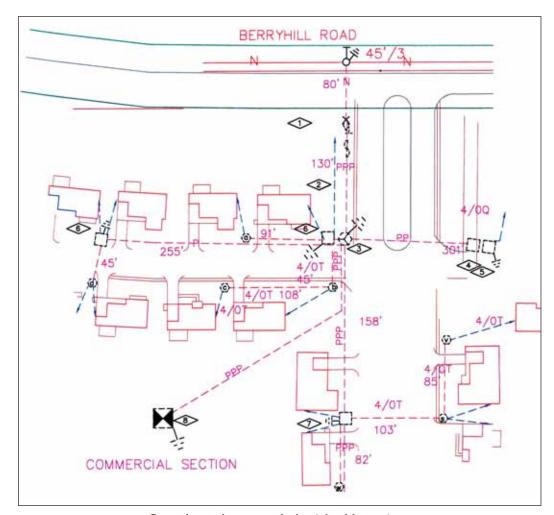
Typical three-phase open-delta system.

#### **SUMMARY**

We hope you have found this resource guide useful in planning your underground project. Our customers have indicated that they prefer to have options associated with their utility developments. Accordingly, we have intended to present a comprehensive range of choices in order to provide the highest level of service and satisfaction at the lowest possible cost. We believe that the best way to meet these goals is through cooperation, communication and teamwork with our customers and other service providers. The following pages contain specification plates to assist you in the development of your project. If you have questions, please contact the Gulf Power Engineering representative for your area.

# READING GULF POWER'S DRAWINGS

The key to understanding Gulf Power's drawing package involves knowing and recognizing the symbols used on our various drawings.



Sample underground electrical layout

	LEGEND:
-	INDICATES SERVICE TO BE INSTALLED BY GPCO
	SECONDARY RUN REQUIRES 1-2" DUCT TO BE INSTALLED
P	1 PRIMARY CABLE REQUIRES 1-2" DUCT TO BE INSTALLED
PP	2 PRIMARY CABLES REQUIRES 2-2" DUCTS TO BE INSTALLED
PPP	3 PRIMARY CABLES REQUIRES 3-2" DUCTS TO BE INSTALLED
(Ç)	SECONDARY PEDESTAL
	SINGLE PHASE PAD-MOUNT TRANSFORMER
0	SINGLE PHASE SWITCHING CABINET
	TWO SINGLE PHASE PAD-MOUNT TRANSFORMERS WIRED 3-PHASE OPEN DELTA 120/240 VOLTS
×	THREE PHASE PAD-MOUNT TRANSFORMER
$\Leftrightarrow$	THREE PHASE SWITCHING CABINET
Ŷ OR Ŷ ≪\$>	RISER POLE FOR UNDERGROUND CABLES STATION NUMBER

#### SPECIFICATION PLATES

#### **Duct Installation Notes**

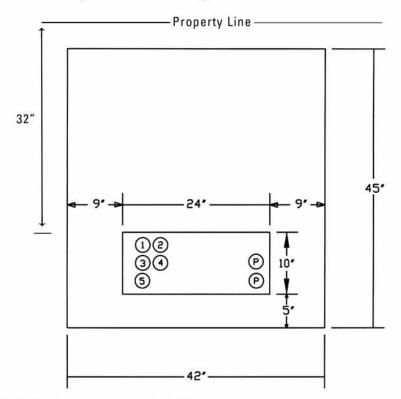
- 1. All duct, except stub-ups, shall have a minimum of 36 inches of cover, below final grade. Duct buried deeper than 48 inches below final grade shall have prior Gulf Power approval.
- 2. Duct shall have a vertical and horizontal clearance of 12 inches from all foreign utilities.
- 3. Unless noted, all duct and bends shall be 2-inch electrical grade, Schedule 40 gray PVC.
- 4. All 45- and 90-degree bends shall have a 36-inch radius.
- 5. All duct shall be stubbed out with 90-degree bends at all transformer and pedestal locations. This includes the stubouts at transformer and pedestal locations for future services.
- 6. Every duct end shall be sealed with vinyl end caps (but not glued).
- 7. The area under transformer pads shall be compacted and leveled to final grade.
- 8. One #16 TFFN copper wire shall be installed in every trench for locating duct before conductors are installed.
- 9. The tops of all stub-outs are to be five (5) inches above final grade.

Examples of a joint trench.



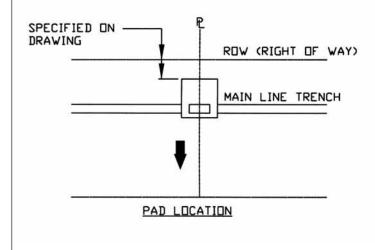


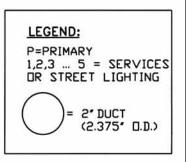
# Typical Duct Layout for Single-Phase Transformer in R/W

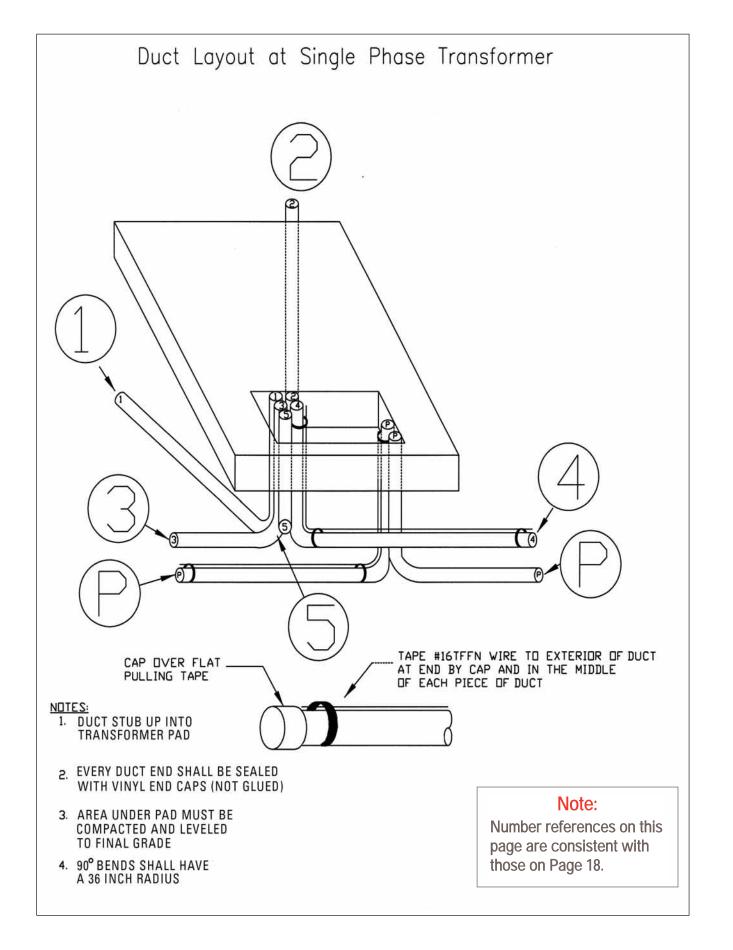


#### NOTES:

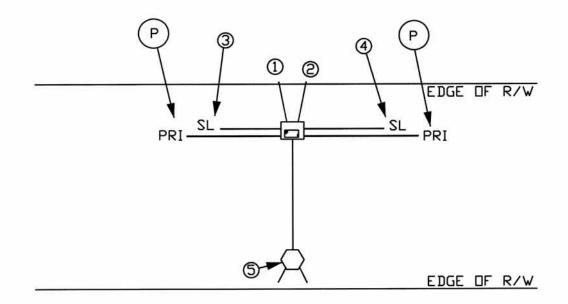
- TOP OF ALL DUCTS ARE TO BE 5 INCHES ABOVE FINAL GRADE.
- 2. DUCTS WHICH ARE NOT NEEDED MAY BE OMITTED OR, IF REQUESTED ON THE JOB, AN ELBOW MAY BE INSTALLED (CAPPED AND TAGGED "SPARE").
- INSTALL VINYL END CAPS IN ALL DUCT STUB-UPS. DO NOT GLUE CAPS.
- 4. 90 DEGREE BENDS FOR FUTURE SERVICES SHALL BE INSTALLED WITH PRIMARY AND SECONDARY DUCT.

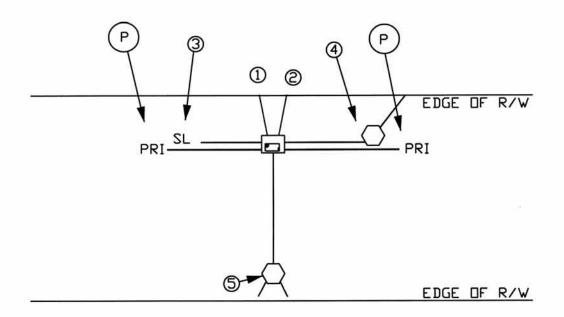






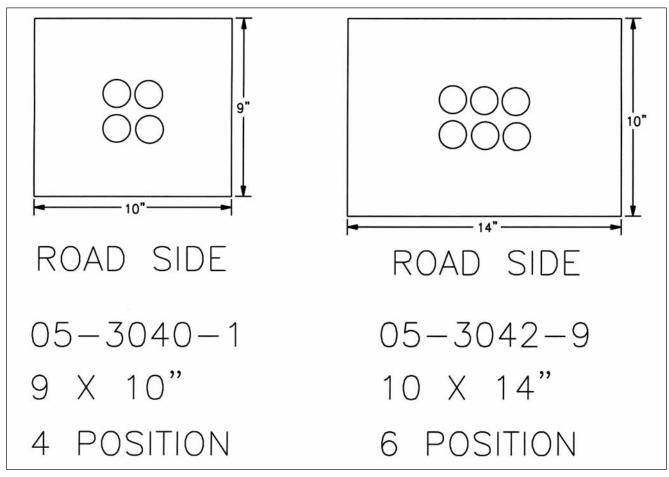
# Typical Duct Layout in Subdivision





NOTE: SERVICE OR LIGHTING DUCTS WHICH ARE NOT NEEDED MAY BE OMITTED OR, IF REQUESTED ON THE JOB, AN ELBOW MAY BE INSTALLED CAPPED AND TAGGED "SPARE".

### **Secondary Pedestal Duct Layout**



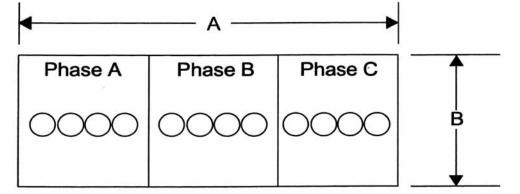
Note: Top of all stub-outs shall be 5" above grade.





#### SINGLE DOOR

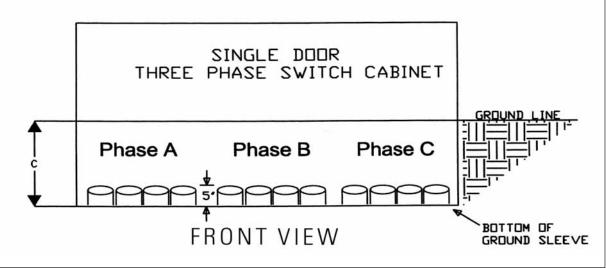
THREE PHASE SWITCH CABINET



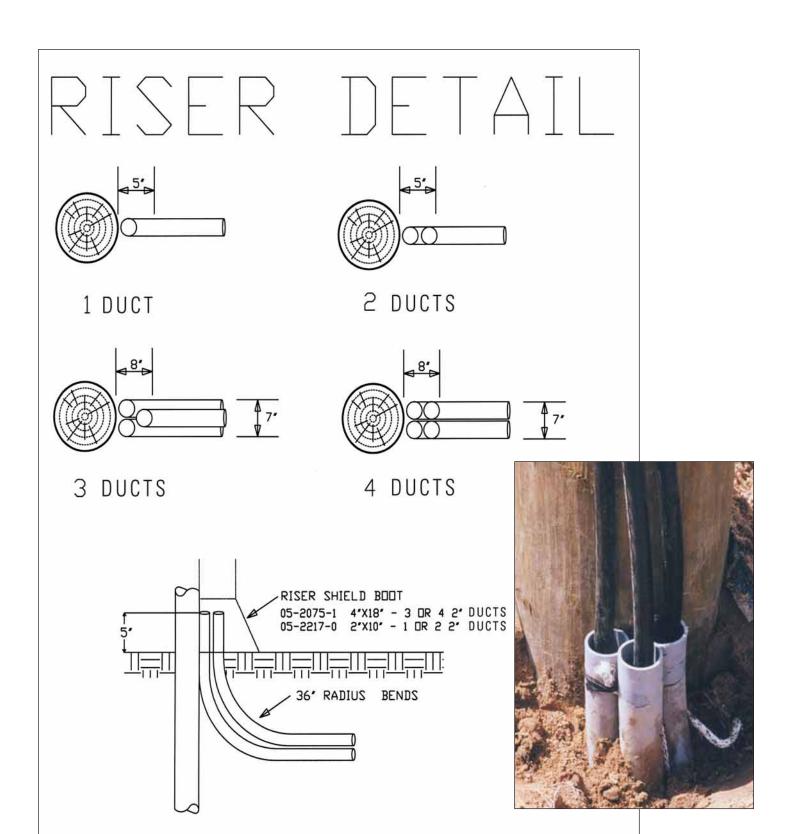
Voltage	Α	В	С
15 kV	60"	15"	15"
25 kV	66"	21"	30"

TOP VIEW

- NOTE: 1. SEPARATE DUCTS BY PHASE AS SHOWN BELOW.
  - 2. DUCTS TO EXTEND 5" UP FROM BOTTOM OF GROUND SLEEVE.
  - 3. IF CABINET IS NOT INSTALLED WITH DUCT, THEN DUCTS TO EXTEND 5" ABOVE GRADE.



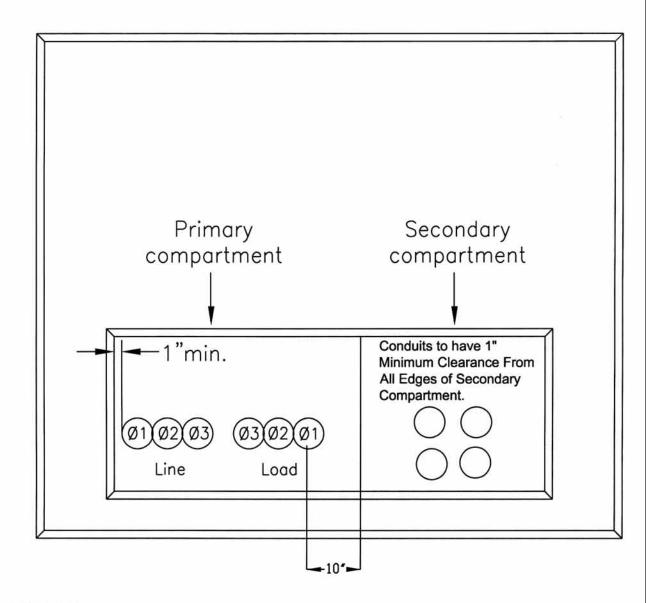




Duct shall be placed as close to pole as possible; and on the side of pole determined by Gulf Inspector.

#### Duct Detail in Three-Phase Padmounts

Consult Engineering for exact pad size and dimensions for your application.



#### **NOTES:**

There will be a maximum of six (6)
 Ducts in the secondary compartment.





Project Name		Developer's Name			
Work Order #	Engineer's Name	of the second	Date		Engineer's Phone Number
Warehouse Locat	ion				Phone
	y Company - Attn: Jimmy n Street, Pensacola, FL 32 0 p.m.				850-469-9112
Fort Walton B	each Warehouse d Boulevard SW, Fort Walt	on Beach, FL			850-244-4719
☐ Panama City V	Varehouse reet, Panama City, Florida	í			850-872-3248
Description			Required	ENGINE IN	Issued
☐ 2" Duct (ft) (05	5-7704-9)				
☐ 2" Coupling (e	ea) (05-7745-0)				
2" Bends (ea)	(05-7915-4)				
2" End Cap (ea	a) (05-7721-8)				
☐ 3" Duct (ft) (05	5-1133-3)				
☐ 3" Coupling (e	ea) (05-1255-5)				
☐ 3" Bends (ea)	(05-1135-1)				
☐ 3" End Caps (e	ea) (05-7722-7)				
☐ Tracer Wire (ft	() (01-2050-4)				
☐ Glue (cans) (1-	4-2130-3)				
(2 cans/1000 ft	t of duct)				
Check Received E	By: (must be signed in blue ink)	Duct Issued By:		Duct Rec	eived By:
Date:		Date:		Date:	

#### **Developer's Requirements**

- 1. Vehicle with 16 foot open bed to transport 20 foot duct duct loaded via forklift.
- 2. Customer to provide any necessary safety flags for transport.
- 3. All signatures must be in BLUE ink.
- 4. An original duct order form is necessary, material will NOT be issued from copies.
- 5. Call 48 hours before pick up for orders of 5,600 feet or less, allow 10 working days for order greater than 5,600 feet.

  All orders must be picked up within 15 days after call.
- 6. Customer must have mechanical equipment available to unload duct if Stuart Irby is able to deliver to site.

Duct Order Form.xls Rev. 11/21/00

# CONTACT LIST

#### Main Engineering Offices

Pensacola	850-429-2600
Milton	850-429-2420
Fort Walton Beach	850-244-4728
Crestview	850-689-4628
Destin	850-244-4738
Panama City	850-872-3212

#### <u>Underground Coordinators</u>

Pensacola District	850-429-2806
Milton	850-429-2723
Gulf Breeze	850-429-2723
Fort Walton Beach District	850-244-4715
Crestview	850-244-4715
Destin	850-244-4715
Panama City District	850-872-3266
Panama City Beach	850-872-3266
Chipley	850-872-3266





Every Day. So Many Ways.