



HOW FIBERGLASS CONDUIT SUPPORTS **UNDERGROUND TRANSMISSION, DISTRIBUTION, AND DATA CENTER INFRASTRUCTURE**



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Underground electrical infrastructure must withstand corrosive soil environments, sustained mechanical loading, thermal cycling, and high-value cable systems that demand long-term reliability. In utility transmission and distribution networks and data center power systems, conduit selection directly influences installation efficiency, electrical safety, and lifecycle performance.



Champion Duct® fiberglass conduit is engineered to support underground direct buried (DB) and encased buried (EB) installations where dielectric performance, corrosion resistance, and reduced pulling friction are critical.

Intended for electrical engineers working on large scale utilities and data center projects, utility design engineers, engineering, procurement and construction (EPC) firms, underground transmission and distribution planners, and electrical contractors installing DB and EB systems, this guide examines the engineering characteristics that make fiberglass conduit a strong specification choice for underground utilities and data center projects.

Underground Installation Types in Utility and Data Center Projects

Direct Buried (DB)

Direct buried conduit is installed in a trench and backfilled without concrete encasement.



This installation type is common in:

- Underground distribution systems
- Substation feeder routes
- Data center campus distribution loops

Design considerations include:

- Soil chemistry and corrosivity
- Trench depth and compaction
- Moisture exposure
- Mechanical loading

Encased Buried (EB)

Encased buried conduit is installed within concrete duct banks, often terminating in vaults or pull boxes.



This is frequently used in:

- Underground transmission corridors
- Utility substations
- Hyperscale data center campuses
- Redundant medium voltage distribution pathways

EB systems require dimensional stability, shape retention under load, and compatibility with concrete curing conditions.

Engineering Characteristics That Influence Project Success



Corrosion Resistance in Aggressive Soils

Metallic conduit systems are susceptible to corrosion in moist, chloride-rich, or chemically aggressive soil conditions. Fiberglass conduit does not rust, pit, or scale and is resistant to:

- Salt exposure
- Many chemicals
- Industrial contaminants

For utilities and data centers requiring 30-50 year infrastructure life cycles, corrosion resistance reduces long-term maintenance.



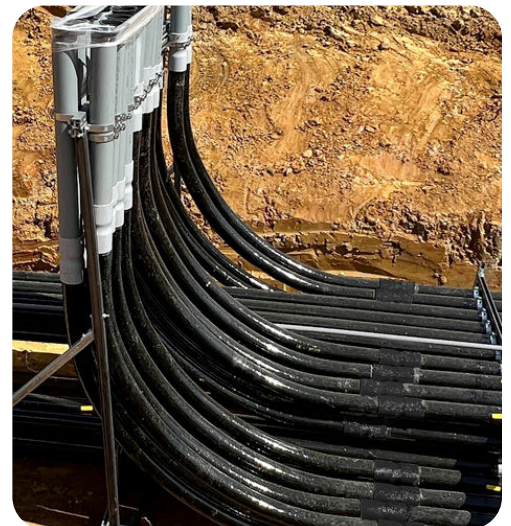
High Dielectric Strength

Underground transmission and distribution systems, including medium voltage circuits, require conduit systems that do not introduce unintended conductive paths.

Fiberglass conduit acts as an electrical insulator and provides high dielectric strength. Unlike metallic systems, it:

- Does not conduct stray current
- Does not rely on grounding or cathodic protection for corrosion mitigation, unlike metallic conduit systems
- Supports electrical isolation in substation and feeder applications

For utility engineers, dielectric performance is a critical design consideration in underground infrastructure.



Coefficient of Friction and Pulling Efficiency

Cable pulling tension directly affects vault spacing, labor requirements, and conductor protection.

Champion Duct fiberglass conduit provides a low coefficient of friction (approximately 0.38 with PVC-jacketed cable), supporting longer pulls and reduced pulling stress.





Coefficient of Friction and Pulling Efficiency (cont.)

Lower friction can enable:

- Increased vault spacing
- Reduced cable damage risk
- Lower pulling tension
- Improved installation efficiency

For large utility duct banks and data center feeder systems, these factors influence both construction timelines and infrastructure cost.

Coefficient of Friction Comparison

CONDUIT MATERIAL	COEFFICIENT OF FRICTION
Fiberglass (Epoxy)	0.38
Galvanized Rigid Steel	0.55
PVC Schedule 40	0.90



Burn-Through Resistance

Fiberglass conduit elbows do not burn through when pulling cable as can happen with PVC conduit. Fiberglass allows for seamless pulling where the elbow stays intact.



Cable Fault Resistance

During fault conditions, cables can potentially melt or fuse conductors to the interior conduit wall. Fiberglass conduit will not melt or weld conductors during a cable fault event, preserving system integrity and making replacement of the cable easier, without damaging the conduit.

For medium voltage systems and mission-critical data center circuits, this characteristic supports operational resilience.



Temperature Tolerance

Fiberglass conduit is operable in temperatures of -40° to $+230^{\circ}$. Additionally, it is UL listed to 110° . This temperature rating results in less ampacity derating for the cable.



Mechanical Strength and Shape Retention

Fiberglass conduit retains its original shape after impact or compression. This “memory” characteristic supports:

- Concrete encasement applications
- High compaction trench installations
- Long-term dimensional stability in duct banks

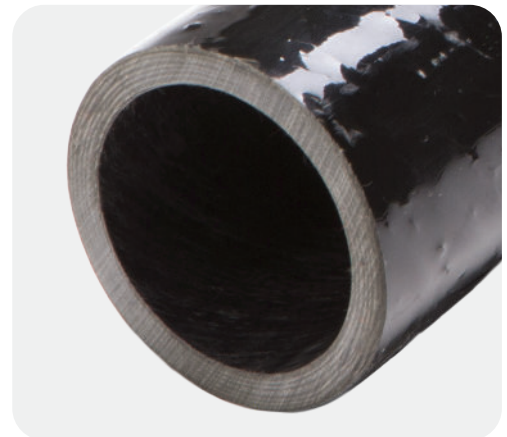
Wall thickness selection allows engineers to match structural requirements to installation conditions.



Wall Thickness Selection for Underground Applications

Fiberglass conduit is available in:

- **Standard Wall (SW)** – suitable for most EB and typical DB installations
- **Medium Wall (MW)** – commonly specified for 5” and 6” diameters
- **Heavy Wall (HW)** – recommended for deep trenches, high compaction, and jack-and-bore conditions
- **Extra Heavy Wall (XW)** – required for Class I, Division 2 applications and where enhanced physical protection is necessary



Wall selection should be verified by the contractor and approved by the engineer of record based on:

- Trench depth
- Soil compaction rate
- Loading conditions
- Project specifications

Joining Systems for Below-Ground Reliability

Underground conduit performance depends on proper joint selection.

Interference Joint

- Concrete-tight
- Suitable for encased buried applications

Gasket Joint (Triple Seal)

- Water-tight and concrete-tight
- Suitable for direct burial
- High pull-out strength (up to 2,000 lbs).

Tight Lock Joint

- Permanent adhesive-bonded system
- Water-tight
- Suitable for above-ground transitions and hybrid installations.

Installation Efficiency and Labor Considerations

Installation labor plays a significant role in utility and data center project budgets and timelines. Fiberglass conduit offers:

- Lightweight handling
- Ease of cutting in field
- Integral bell configurations
- Lower NECA labor rates
- Lower pulling tension requirements

NECA labor unit data shows favorable installation rates for fiberglass conduit, particularly in sizes 1-1/4" and above.

NECA LABOR INSTALLATION RATES

	EMT	PVC SCH 40	PVC SCH 80	ALUMINUM	STAINLESS STEEL	GALVANIZED RIGID STEEL	EPOXY FIBERGLASS	PVC COATED STEEL
1-1/4"	6.2	6.0	7.2	6.5	10.0	8.0	5.4	12.0
1-1/2"	7.0	7.0	8.4	7.0	11.25	9.0	5.72	15.0
2"	8.0	8.0	9.6	8.0	13.75	11.0	6.08	18.0
2-1/2"	9.5	9.0	10.8	10.0	18.75	15.0	6.39	21.0
3"	11.0	10.0	12.0	12.0	25.0	20.0	6.75	26.0
3-1/2"	13.0	12.0	N/A	15.0	31.25	25.0	7.07	32.0
4"	16.0	14.0	16.8	19.0	37.5	30.0	7.43	38.0
5"	N/A	18.0	21.6	24.0	47.5	38.0	7.74	45.0
6"	N/A	24.0	28.8	30.0	60.0	48.0	8.1	60.0

(Normal installation hours per/100 ft) (REF: 2025-2026 NECA Manual of Labor Units) *Reduce labor units by 10% for 20-foot lengths

Case Study: Underground Utility Optimization



Results

In a [below-ground utility installation](#), fiberglass conduit enabled vault spacing to increase from 250 feet to more than 750 feet.

- Reduced number of vaults required
- Lower pulling and connection labor
- Overall project savings of \$3,000,000

The low coefficient of friction allowed longer pulls without exceeding acceptable tension limits, reducing intermediate infrastructure requirements.

For large utility and campus-scale data center deployments, vault optimization can significantly affect capital expenditure.



Code Compliance and Quality Standards

Champion Duct fiberglass conduit is:

- UL 2420 Listed for below-ground applications
- UL 2515 Listed for above-ground applications
- Manufactured in Spring, Texas in an ISO 9001:2015, ISO 14001:2015, and ISO 45001:2018 certified facility
- [BABA compliant](#)



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Conclusion

Underground transmission, distribution, and data center infrastructure demand conduit systems that support corrosion resistance, ease of pulling cable, installation efficiency, and long-term structural integrity. Champion Duct fiberglass conduit provides:

- High dielectric strength
- Corrosion resistance in aggressive soils
- Low coefficient of friction
- No burn-through
- Cable fault resistance
- Multiple wall thickness options for engineered selection
- Code-compliant listings

[Get specs, safety data sheets \(SDS\), and information.](#)