



Distribution Department

INTRODUCTION

Burns & McDonnell provides a full range of services to support your company in the planning, analysis and design of its overhead and underground distribution systems. We tailor our approach to meet each project's unique requirements and to meet each client's specific needs. With this flexibility, we can provide a full range of planning services or help clients develop their own planning capabilities. Burns & McDonnell can design, stake and inspect distribution lines and has extensive experience mapping assets, performing attribute inventories, assessing asset condition and performing system evaluations.

PLANNING AND ANALYSIS

From load forecasts to short-range and long-range plans; sectionalizing studies and power quality studies, Burns & McDonnell's Distribution Department provides comprehensive planning and analysis. Load forecasts are developed for a defined planning period, based on simple trending or econometric modeling. Short-range plans and construction work plans are typically performed every two to three years depending on the growth experienced by the client and include a detailed construction schedule and capital improvement budget. Long-range plans, on the other hand, typically span a ten to twenty-year study period. Existing systems are evaluated to identify immediate needs, and future load levels are projected by feeder or substation areas. Sectionalizing studies provide a critical analysis of the loading and fault current duty for the distribution system protective equipment. In some cases, power quality and reliability concerns dictate the development of different protective schemes.



DESIGN

Burns & McDonnell's experience in overhead and underground distribution line design and construction has been developed through involvement in municipal and rural electric systems as well as special applications such as power generating facilities, industrial facilities and theme parks. This knowledge in distribution design and construction is complemented by our distribution material and labor database. This database assists our personnel in estimating distribution construction costs, thus allowing our clients to financially plan for future system improvements.

We can provide overhead distribution line staking and design, which may include inventory, easement procurement, line routing, field staking, staking sheets, plan and profile drawings, construction contract documents, bid evaluation and contract administration.

Our customized staking manual provides the background information on the practices of field staking and specific formulas that may be required for unique installations. The manual includes string and sag data, clearance tables, guy lead tables and pole class analysis. The tables are customized for the specific conductors, ruling spans and hardware used by your company.

Burns & McDonnell has extensive experience in underground distribution routing design, manhole sizing, plan and profile drawing generation and specification writing, and we have the personnel on staff with field experience related to cable testing, testing for concentric neutral integrity and cable fault location.



COMPUTER MAPPING

System mapping has become increasingly important to today's progressive utility companies. Many are realizing the necessity and advantages of accurate, updated maps for system operations, engineering analyses, load and growth planning as well as establishing maintenance programs. Current maps are also valuable in performing inventory audits or interfacing with property owners and other utilities. Burns & McDonnell recognizes the value of current, accurate maps that are easily stored and reproduced. We are pioneers in the application of PC-based computer-aided mapping (CAM) and can tailor our comprehensive services to our clients' specific needs.

Through today's versatile microcomputers, Burns & McDonnell has modernized mapping development and drafting operations. We have

refined techniques and written enhanced support programs that are used with AutoCAD open-system software to streamline the development, file management and interchange file support using standard ASCII text files that can be read by database or spreadsheet programs. Burns & McDonnell's services offer an efficient means of developing and maintaining modern, computerized maps and mapping systems at an affordable cost.

OUR COMPREHENSIVE SERVICES

Burns & McDonnell offers experienced engineers and technicians trained in microcomputer-based mapping. We provide a complete service or provide trained personnel, specialized programs and technical training. Our services can be configured to accommodate your individual needs; for instance:

- Burns & McDonnell works with utilities, developing geographical background maps that allow our clients to add their facilities and other pertinent data at their convenience.

- We assist our clients in selecting the required equipment to establish their own computer-aided mapping system as well as provide technical support to help make the new system operational and efficient.

- We provide specialized programs with support documentation and techniques that simplify and enhance the CAD software; such as developing physical maps and the utility engineering analysis model in one operation.

- We provide comprehensive operational training, program development, file management and interchange file support using standard ASCII text files that can be read by database or spreadsheet programs.

- We assist in modernizing records by digitizing (computerizing) existing maps that may then be maintained by our clients.

- Our field staff performs or assists our clients in field inventories and gathering data for inclusion into maps and databases.



RECENT PROJECTS

CITY OF BURBANK, CALIFORNIA

Burns & McDonnell prepared standard construction details of Burbank's 12-kV overhead and underground distribution system. These drawings included pole, riser, and padmount equipment elevations; transformer connection schematics; and bills of material for each standard detail. Designs were prepared in accordance with G.O. 95, Burbank's standards, and all applicable codes.

RIVERSIDE PUBLIC UTILITIES

Burns & McDonnell prepared the electrical design and specifications to underground existing 12.47-kV overhead distribution and lighting system as part of City of Riverside's extension of Jurupa Street. Work was performed in accordance with the State of California standards General Order 95 and 128 and City standards.

ANAHEIM PUBLIC UTILITIES

Burns & McDonnell prepared the civil base map that included other utilities and facilities. The base map was prepared through a fly-over of the area. Scope of work included contacting other utilities and facility holders; obtaining the information from them for addition to the civil base map; developing electrical single line diagram; duct bank structure; selecting transformer, capacitor and switch locations; sizing the cables; preparation of equipment specifications and bill of materials and construction support.

Burns & McDonnell was also responsible for notifying the property owners; obtaining their permission and preparing related paperwork.

ANAHEIM PUBLIC UTILITIES

Burns & McDonnell was retained to conduct a study related to deteriorating cotton-braided insulation on secondary distribution cables. Scope of work included conducting a survey of other West Coast utilities and tabulating their results.

PALO ALTO PUBLIC UTILITIES

As part of the City's Fiber-to-the Home project, Burns & McDonnell was retained by the City to survey existing poles; collect pole data; determine cable attachment heights, and analyze the structural integrity of the poles in accordance with the requirements of the State of California standards General Order 95 and 128 and City standards.

CITY OF RICHLAND, WASHINGTON

Burns & McDonnell is currently working with the City of Richland to design multiple projects to replace 12.5-kV distribution circuits of World War II vintage. The effort includes design of three phase or one phase circuits, surveying as required and managing the design team during multiple projects. During this process Burns & McDonnell has the responsibility to work with the property owners on behalf of the City.

Burns & McDonnell is providing design, survey, staking and permitting services for new feeders and feeder upgrade projects. These projects involve using City of Richland distribution standards as well as local, state and federal codes.

PUBLIC UTILITY DISTRICT OF FRANKLIN COUNTY, WASHINGTON

Burns & McDonnell is providing substation feeder getaway designs, and overhead and underground feeder rebuilds required for a new 115-kV to 12.5/7.2-kV substation for Franklin County PUD. Recent and current projects include distribution line design including structure loading and cable pulling tension calculations, field surveying, field staking for construction crews, right-of-way research, easement descriptions, material list, one-line diagram and construction drawings and details.

PUBLIC UTILITY DISTRICT OF GRANT COUNTY, WASHINGTON

Burns & McDonnell is currently providing transmission, substation, and distribution services for Grant County PUD, including a new 230-kV substation and transmission design, distribution upgrade projects, communications and fiber-optic projects. This is a continuing-services contract agreement. Current projects have included the design of a new 230-kV 5-position breaker-and-a-half switching station at the Priest Rapids Dam and numerous distribution line and fiber optic design projects.

A recent substation project was the design of a new 230-kV 5-position breaker-and-a-half switching station at the Pries Rapids Dam. This included design for a 2-phase construction effort to minimize outage time structure and foundation design, relay protection modifications and upgrade material specifications and construction specifications. Design was essentially complete when the project was cancelled.



Recent distribution projects have been designed for rural, urban, retail/commercial and airport applications. Projects have included overhead and underground feeder upgrades, new builds, overhead to underground conversions and substation get-aways. Project responsibilities include loading studies for underbuild on transmission lines, distribution line design, field surveying, and field staking for construction and permitting for powerline crossings. Permit applications have included Bonneville Power Administration, Avista Power, Columbia Basin irrigation districts, US Bureau of Reclamation, city and county road departments, Department of Transportation and other state and federal agencies. Burns & McDonnell also provides work order packages, including AutoCAD drawings and summary of material units.

Recent fiber optic projects have been designed for rural and urban applications. Projects include overhead and underground backbone and hub build-outs. Project responsibilities include structure analysis studies for underbuild on transmission and distribution lines, field surveying, field staking for construction and permitting for fiber optic crossings. Permit applications have included Bonneville Power Administration, Avista Power, US Bureau of Reclamation, city and county road departments, Department of Transportation and other state and federal agencies. Burns & McDonnell provides work order packages, including AutoCAD drawings and summary of material units.

PUBLIC UTILITY DISTRICT OF CLARK COUNTY, WASHINGTON

Burns & McDonnell provided distribution services for Clark County PUD, including new 12.5/7.2-kV distribution design, upgrade projects, re-conductoring, and line staking. This is a continuing-services contract agreement. Current projects include the design of 3 miles of overhead 397.5kcmil tree wire conductor with numerous reclosers and three phase switches. Burns & McDonnell evaluates and calculates distribution line loading and pole strength requirements. Burns & McDonnell also provides work order packages that include detailed Autocad drawings, specifications, summary of construction materials, and project bid estimates.

CITY OF BENTONVILLE, ARKANSAS

Substations “E” & “F”

Burns & McDonnell has completed new 161/12.47-kV distribution substations, designed as a single bus arrangement at 161-kV and main and transfer bus arrangement at 12.47-kV. Each substation consists of a single 161-kV SF6 circuit breaker, a 161/12.47-kV, 18/24/30 MVA power transformer, five feeder breaker bays, a control building with relay panels and auxiliary systems. Substation “F” also included 15-kV underground duct banks for 15-kV feeders.

Substation “D” Expansion

We have also designed the expansion of an existing 69/12.47-kV distribution substation, as a single bus arrangement at 69-kV and main and transfer bus arrangement at 12.47-kV. Expansion includes extending the existing 69-kV buswork, addition of a single 69-kV power circuit breaker, a 69/12.47-kV, 12/16/20 MVA power transformer, two feeder breaker bays and transformer differential and overcurrent relaying.

PUGET SOUND ENERGY

Burns & McDonnell has worked with Puget Sound Energy to perform the analysis and design for upgrading the maximum design operating temperature of two PSE 115-kV lines. This work involved review of existing structures and structure drawings, field verification of locations of structures and obstructions, and analysis in PLS-CADD at 75 and 100 degrees C. Additional projects for PSE include distribution design, such as substation get-away feeders, overhead and underground feeders, and public improvement relocations. These projects involved using PSE distribution standards as well as local, state and federal codes.

SUMTER ELECTRIC COOPERATIVE

Burns & McDonnell worked with Sumter Electric Cooperative to develop globally positioned geographical background system maps. Burns & McDonnell developed highly accurate land base maps by traversing Sumter’s service territory using GPS instrumentation imported and corrected onto a USGS background map. We assisted in modernizing Sumter’s records by digitizing (computerizing) existing subdivision maps and performing GPS field inventories for inclusion into CAPD’s mapping and database software package.



KANSAS CITY POWER & LIGHT

Burns & McDonnell designed and prepared the layout of a 2.8-mile section of a three-phase, single circuit, 12.47-kV distribution tie-line between two substations. The line was designed for 477 kcmil AAC utilizing wood pole and crossarm construction. Approximately 1.5 miles of the line route contained existing facilities that were inventoried and noted for transfer or retirement. Burns & McDonnell performed a material take-off for the project, prepared a construction cost estimate and developed 3 three color drawings using our computer-aided drafting system and KCP&L's standard symbols and format.



KOCH REFINING COMPANY

In a plant-wide Electrical Systems Improvement Project, Burns & McDonnell was retained by Koch Refining Company to study, recommend and design improvements at their newly acquired East Refinery. The primary distribution system consists of 15-kV shielded power cables installed in cable tray and duct banks throughout the refinery. Extensive site investigations and underground probing is required to determine the most suitable routes. Cable trays are being installed on existing pipe racks and on new supports. A primary distribution feeder loop is also being designed to support four existing distribution substations that are currently on a residential utility feeder.

LAKE CITY ARMY AMMUNITION PLANT, US ARMY CORPS OF ENGINEERS

Burns & McDonnell performed a study of the Exterior Electrical Distribution System of the Lake City Army Ammunition Plant in Independence, Missouri. The recent project objectives of the study were to perform an overall assessment of the present system and to prepare a written report with recommendations for improvements to meet current safety codes, minimize outages, reduce operating costs, upgrade to current industry standards and accommodate full mobilization of military service requirements.

The study included a computer simulation of system performance, including load flow, voltage drop and short-circuit analyses, a determination of system power factor correction requirements, an analysis of the feasibility of system conversion to 12.47-kV operation, and analysis of the adequacy of the present protective relaying scheme.

As part of the study, Burns & McDonnell selected and designed several routes for new overhead and underground distribution lines as well as

location of all pole and pad mount transformers. The complete design addressed the correction of numerous existing safety code violations and the capability of the system to supply existing and future electrical loads. Specific engineering analysis and design included wind and ice loading analysis, conductor sag/tension and vibration design and analysis, clearance analysis, structure loading analysis, structure spotting, line route selection, coordination of design routes with existing buried facilities, foundation designs, manhole design and placement, conductor and cable size selection, conduit size selection, cable pulling tension analysis and fault-current analysis.

SOUTHEAST IOWA ELECTRIC COOPERATIVE

Since 1993, Burns & McDonnell has provided distribution line design and staking services for 16 and 50 miles of 12-kV overhead lines. Designs were in accordance with RUS specifications and included staking and materials take-offs. Burns & McDonnell prepared the RUS Form 792 for the 16-mile line and the RUS Form 830 for the 50-mile line. Burns & McDonnell also provides communications consulting services as needed on the co-op's existing system.

SOUTHEASTERN ILLINOIS ELECTRIC COOPERATIVE

The project consisted of preparation of a Construction Work Plan to provide system management with a coordinated construction program and annual budget. Burns & McDonnell evaluated the performance of the existing system with respect to capacity and loading, voltage conditions, losses, service reliability, adequacy of sectionalizing and quality of service. Burns & McDonnell tabulated each year's system construction requirements including new consumer extensions, tie lines, line changes, distribution transformer capacity increases and substation changes.

NEW ULM (MINNESOTA) PUBLIC UTILITIES COMMISSION

Burns & McDonnell modeled the New Ulm electrical system, determined the available fault currents in the system, compared these currents to equipment ratings, and checked relay and fuse coordination. The 69-kV transmission system, substation wye-delta-wye and wye-delta transformers, generators, motors and distance and overcurrent relays were modeled in Aspen OneLiner. The 13.2-kV and 2.4-kV distribution lines and transformers were modeled in Milsoft. Burns & McDonnell coordinated the distance and overcurrent, phase and neutral, microprocessor and electromechanical relays and system fuses.



In addition, the project included a check of the bus, reclosing, synchronism check, frequency, breaker failure, generator and transformer relay settings.

NISHNABOTNA VALLEY RURAL ELECTRIC COOPERATIVE

Burns & McDonnell performed staking services for 7.5 miles of single-phase 7.2-kV overhead distribution line associated with a public improvement project on Iowa State Highway 44. Burns & McDonnell was responsible for coordination with the Iowa Department of Transportation and landowners pertaining to right-of-way acquisition. A two-man crew inventoried existing facilities and established the line routing. Burns & McDonnell performed the design and field survey in accordance with Nishnabotna's specifications. Staking sheets were generated indicating the location of all wood-pole structures and equipment required at each location. Construction units were summarized to facilitate material takeoff for construction.

MATANUSKA ELECTRIC COOPERATIVE,ALASKA

Burns & McDonnell provided this Palmer, Alaska, cooperative with in-house distribution design staff to perform routine distribution design and staking duties for overhead and underground primary and secondary services.

NORRIS ELECTRIC COOPERATIVE

Burns & McDonnell worked with Norris Electric Cooperative in developing geographical background maps that allow it to add to its facilities and other pertinent data at its convenience. Burns & McDonnell assisted in modernizing records by digitizing (computerizing) existing maps and provided comprehensive operational training, program development, file management and interchange file support using standard ASCII text files that can be read by database or spreadsheet programs.

MARSHALL COUNTY RURAL ELECTRIC COOPERATIVE

Burns & McDonnell prepared a long-range plan to provide guidance for system management and the development of future construction programs and studies. The long-range plan involved completing an analysis of the existing distribution system and projecting load growth for ten and twenty years. The existing system was analyzed to determine its ability to serve the projected loads and at least two alternatives were developed to determine the most economical method to correct each projected system deficiency.

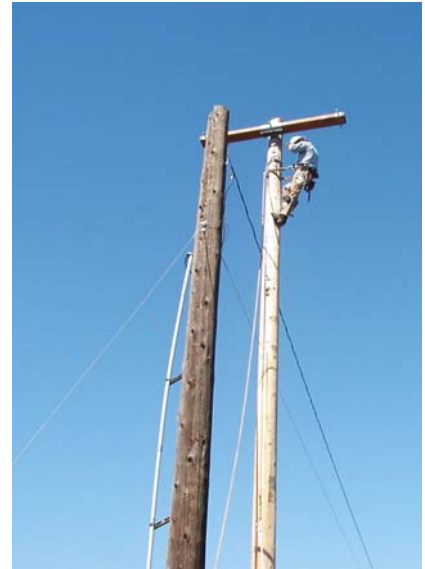


CITY OF ANTHONY, KANSAS

Burns & McDonnell designed a new distribution voltage regulator station, 7 miles of overhead 12-kV feeders on wood poles and a new 12-kV switchgear at the city power plant. Burns & McDonnell completed the conversion of over half of the downtown area from a 4160V to 12-kV system. Burns & McDonnell provided field construction inspection on an as-needed basis for the city.

GREENWOOD UTILITIES COMMISSION, MISSISSIPPI

Burns & McDonnell designed a tubular steel and wood pole line through the City's industrial district to provide a reliable intertie between Greenwood Utilities Commission's (GUC) Henderson Station and a Mississippi Power & Light substation. An existing 13.8-kV distribution line was relocated onto the new structures, optimizing the use of right-of-way. Burns & McDonnell extensively modified the substation to connect with a new grounding transformer and new 750 MVA switchgear that provides feeders for several distribution circuits. This new intertie system provides GUC a better means of purchasing electricity from neighboring utilities during peak load and station maintenance situations, in addition to improving voltage regulation on their distribution system. An existing tie line control system was modified to allow regulation of electricity purchasing by automatically controlling generation at the Henderson station.



JACKSONVILLE ELECTRIC AUTHORITY

Burns & McDonnell worked with JEA to design the conversion of 1.1 miles of 26.4-kV overhead distribution to underground along Beach Boulevard in Jacksonville, Florida. The project involved routing the new line, surveying the route and acquiring easements, designing the new underground line, coordinating with other existing utilities such as water and sewer, ordering materials and identify removals, and preparing construction bid documents. The project also includes design of roadway lighting to FDOT standards.

CONSTRUCTION POWER

Burns & McDonnell distribution engineers have designed temporary construction power services for power plant sites designed by Burns & McDonnell around the country and world.