

Merrimac Municipal Light Department



Residential Developments Policy

General:

This document provides specific instructions for the provision of underground electrical facilities associated with the construction of subdivision housing projects within the Town of Merrimac and interconnected to the MMLD's primary distribution system.

The Town requires that all new residential developments be served by underground electrical systems. In order to maintain the highest level of service reliability, the MMLD's underground residential distribution (URD) systems employ the use of conduit system (box pads, handholes, and ducts) and padmount transformers and sectionalizing cabinets.

Developers and their contractors shall make no deviation from the instructions or specifications provided herein without the expressed written permission of the MMLD.

SECTION 1 – DEVELOPER/CONTRACTOR AND MMLD RESPONSIBILITIES

A. Developer's Responsibilities

The Developer shall be responsible for the following items:

1. Coordinate meetings with MMLD's General Manager, or its designee, to discuss project and review drawings with proposed electrical distribution layout and equipment sizes. Developer shall secure the services of a Professional Electrical Engineering firm familiar with the electrical code and with experience on projects of similar magnitude.
2. Granting or furnishing an easement for all electric facilities. The electric utility easement requirement will be outlined by the MMLD and will consist of three (3) parts: **(a)** a ten (10) foot wide strip (or cable easement) along all front (or street) property lines, **(b)** a five (5) foot wide street crossing from front property line to front property line wherever cable crossings are required, and **(c)** a maximum twenty-two feet wide by twelve feet deep (22' Wx12'D) equipment easement for sectionalizing cabinet/padmount transformer installations or twelve feet wide by twelve feet deep (12'Wx12'D) equipment easement for padmount transformer installations at front lot corner(s) and located equally on each lot. These minimum requirements may be supplemented by additional easement requirements, as necessary, by the design of the development and associated electric and

street light facilities. The transformers, sectionalizing cabinets, handholes and appurtenances will be installed where required on the equipment easements.

3. Providing the MMLD with copies of Subdivision Drawings and Developer Load Data and AutoCAD drawings of the recorded plans approved by the Town of Merrimac showing complete layout of the development, as follows:
 - a. One complete set of Town approved subdivision drawings prepared by the Developer's civil engineer and illustrating the physical layout of all subdivision facilities shall be provided to the MMLD for review and use by the department. Physical drawings shall be to 1" – 40' scale and include topographic plans and indicate the layout of all lots, proposed location of all houses, driveways, septic systems, streets, sidewalks, above ground and buried drainage facilities, water, gas, telephone and cable utilities and facilities.
 - b. Developer shall also provide AutoCAD files of all approved subdivision drawings.
 - c. Developer shall provide the following data for typical residences to be built in the subdivision and other loads such as pumping and lift stations:
 - 1) Size of units in square feet
 - 2) Major electrical appliances, HVAC systems, etc., and their ratings
 - 3) Estimated diversified load for each unit
 - 4) Service size proposed for each unit
 - 5) Calculated load on primary cable of any pumping or lift stations or other special facilities to be served from the electrical system.
4. Planning and installing other utilities so as not to interfere with the installation and operation of electrical and street lighting cables, equipment and appurtenances and if necessary make arrangements for installation of these utilities prior to the electrical installation.
5. Carrying out the following prior to the installation of the URD system:
 - a) Install surveyed lot corner bounds
 - b) Mark the points of curvature and tangency for all street front property line curves
 - c) Install curbs and bring sidewalks to subgrade
 - d) Install grade stakes showing final grade as requested at manholes, trench locations, transformers and handholes.
6. Notifying MMLD immediately of any lot line, project layout or other changes that could affect the electrical layout and sizing of project electrical and street lighting facilities.

7. All costs for MMLD to procure and install equipment needed for the development. In such cases when the MMLD's staff is unable to perform the work necessary to complete all the installation of the electrical equipment, the MMLD will secure the services of outside consultants and/or electrical contractors to perform necessary tasks. These costs will need to be covered by the developer.
8. Construction work including excavation and installation of electrical conduit system per MMLD's specifications indicated in SECTION 2 – LAYOUT AND SIZING OF FACILITIES.
9. All trenches shall be inspected prior to backfilling. The MMLD needs to be notified in advance (at least 24 hours) for all trenches needed to be inspected. Trenches for secondary service laterals from the handhole or secondary connection pedestal shall be inspected by the Town of Merrimac Wiring Inspector. Developer should contact the Wiring Inspector, at the Building Department, to schedule these inspections.

Additional inspections requiring coordination with the MMLD include:

- a. Testing and proving of conduits.
 - b. Installation of ground grids at all padmount transformer and sectionalizing cabinets.
10. Attendance of Developer at a preconstruction meeting with MMLD representatives prior to start of any work.
 11. The supply and installation of the service lateral cable and conduit between all buildings and the MMLD's facilities (handhole, secondary connection pedestal or transformer) in accordance with the Town of Merrimac Wire Inspector's requirements and specifications. The MMLD will make the final customer service connections to its facilities. All other connections are by Developer. *Developer will be responsible for all labor and material expenses incurred by the MMLD, in association with the final connection of service lateral cable.*
 12. The supply and installation of one or more MMLD-approved meter mount devices. These devices shall be located on the outside of single-family residences on the driveway side of the building or on a pedestal mount at approved locations for pedestal mounted meters.
 13. The supply and installation of "soft start" electrical devices on all central air conditioning units in order to minimize the flicker voltage on the secondary system from starting the unit compressor motor.
 14. Assumption of financial responsibility for:
 - a. Any discrepancy or change in final grade or plans which require an alteration of installed URD facilities.

- b. Damage to the URD system during and after installation, caused by the Developer or Contractor and/or his agent or servants.
 - c. Replacement of any equipment or materials and any construction unacceptable to the MMLD.
15. Provide two sets of as-built drawings to the MMLD plus an electronic AutoCAD copy on a CD or memory drive.

B. MMLD Responsibilities

The electric department will perform the following at the expense of the Developer or Contractor:

1. Review and provide comments of the proposed design drawings, including equipment layout, electrical specifications and sizing, provided by Developer's electrical engineering consultant.
2. Procure and install high voltage cable, connections, padmount transformers, street light poles and fixtures, and any other equipment necessary for the completion of the project.
3. Install riser pole(s) as required at the project extremities.
4. Conduct interim and final inspections of trenches, conduit installations and concrete work.
5. Test the completed underground facility prior to energization.
6. Make final customer service connections at the padmount transformers, handholes or pedestal connection boxes and pedestal mounted meters.
7. Supply and install electric consumption meters.
8. Supply and install fuse disconnects on riser pole(s).
9. Make final interconnections between overhead facilities and primary cable terminations.
10. Own, operate and maintain the underground distribution facilities, including primary and secondary systems, cables, sectionalizing facilities, transformers, handholes and streetlights but excluding secondary service laterals to the homes.

IMPORTANT NOTE: Design and installation for any electric distribution infrastructure within the Town of Merrimac will be done by the MMLD. In the event the MMLD is not able to perform these tasks, it will secure the services of an outside contractor properly licensed in the Commonwealth of Massachusetts to perform such tasks. Contractor will work for the MMLD and costs will be passed to the Developer.

SECTION 2 – LAYOUT AND SIZING OF FACILITIES

General:

This section provides general guidelines to the acceptable layout of underground electric and street lighting facilities within any new residential development.

1. Distribution System Characteristics

- a. MMLD's distribution system is a four wire, grounded-wye type, consisting of 4.16 kV three-phase/2.4 kV single-phase lines and 13.8 kV three-phase/7.97 kV single-phase lines. Over time, the 4.16/2.4 kV distribution system facilities will be upgraded to 13.8/7.97 kV.
- b. All primary cable facilities and sectionalizing equipment shall be rated at 13.8 kV to accommodate future conversion to 13.8/7.97 kV operation, but sized to carry the higher load current for 4.16/2.4 kV operation if the electric facilities are initially operated at 4.16/2.4 kV.
- c. Dual voltage padmount transformers will be required if initial operation is at 4.16/2.4 kV.

2. Phase Selection

In order to prevent significant load/voltage unbalances on the MMLD's system, the selection of the type of primary service (i.e., three-phase or single-phase) to each project shall be as follows:

- a. A single-phase installation will be permitted where the maximum load current for the entire project (including all future phases) on the underground primary cable will not exceed the following:

2.4 KV Primary: 50 amperes
7.97 KV Primary: 20 amperes
- b. A three-phase installation is required for all three-phase loads and where single-phase load current for the entire project is expected to exceed the values noted above.

3. Guidelines For Facility Layout

A. Primary Cable/Conduit Layout

1. In order to maintain reliability, the primary cable system shall be arranged for "looped" supply to all padmount transformers or sectionalizing cabinets. For projects with access to only one source of power, it may be necessary to install

duplicate cable runs to achieve a looped supply. MMLD will make final determination based on site location.

2. The looped supply shall normally be installed between two (2) independent feeder access points at physically separate riser poles at the project extremities. Where independent feeders are not available, install two risers on a common pole or risers on two adjacent poles.
3. Conduits shall be installed between riser pole(s), padmount transformers and sectionalizing devices in such a manner to limit the cable “pulling” distance to a maximum of 500-800 feet depending on the specific installation requirements as determined by the MMLD. Sectionalizing cabinets shall be provided as required in the conduit system.
4. For each active cable section, including the conduit to the riser pole(s), there shall be one spare conduit with pulling string installed in the unfilled conduit.
5. Primary cable/conduit systems shall be located in the electric utility easement area off the roadway. Primary cable/conduit system road crossings shall be installed perpendicular to the roadway.
6. Locate electrical conduits on opposite side of street from water mains.

B. Secondary Cable/Conduit Layout

1. Conduits shall be installed for secondary cable installations between padmount transformers and handholes or pedestal connections boxes.
2. For each active secondary cable section there shall be one spare conduit with pulling string installed in the unfilled conduit.
3. Secondary cable/conduit systems shall be located in the electric utility easement area off the roadway. Secondary cable/conduit system road crossing shall be installed perpendicular to the roadway.

C. Service Lateral/Conduit Layout

1. All service laterals shall be installed in Schedule 40 PVC conduit encased in a sand bed.
2. All service laterals shall be connected at a secondary handhole or pedestal connection box; or to a padmount transformer bushing, as determined by the MMLD.

D. Street Light Cable/Conduit Layout

1. All street lights shall be connected through fuses at padmount transformers or secondary pedestal connection boxes.
2. Street light cable/conduit systems shall be located in the electric utility easement area off the roadway. Street light cable/conduit system road crossings shall be installed perpendicular to the roadway.

E. Sectionalizing of Primary Circuit(s)

1. On single-phase primary installations, sectionalizing will normally be performed at the dual bushing, feed through type padmount transformers or at single-phase sectionalizing cabinets as determined by the MMLD. Single-phase sectionalizing cabinets shall be installed where intermediate sectionalizing facilities are required to limit primary cable pulling lengths to 500 – 800 feet depending on the specific installation requirements as determined by the MMLD.
2. On three-phase primary installations, tapping of the primary underground cable loop for single-phase or three-phase padmount transformers shall be accomplished by means of three-phase sectionalizing cabinets and disconnectable cable elbow termination equipment facilities. Sectionalizing cabinets shall also be installed where intermediate sectionalizing facilities are required to limit primary pulling lengths to 500 feet depending on the specific installation requirements as determined by the MMLD.
3. Each sectionalizing cabinet shall be located in an accessible location adjacent to access roads.
4. All sectionalizing cabinets shall be mounted on box pad foundations.

F. Padmount Transformers

1. Each padmount transformer shall be located in an accessible location adjacent to access roads and shall be arranged to supply as many individual homes as practical, with the length of secondary cable from the transformer to each handhole being limited to approximately 200 feet.
2. All padmount transformers and handholes shall be located in the electric utility easement on the lot line between lots so that no service lateral will cross an adjacent property.
3. All padmount transformers shall be mounted on box pad foundations. Concrete pads, per MMLD specifications, may be necessary for some transformers.

G. Secondary Handholes/Pedestal Connection Boxes

1. Secondary handholes or pedestal connection boxes shall be installed to provide a connection point between the padmount transformer and all service laterals. Install handholes in the electric utility easement.
2. Secondary or pedestal connection boxes shall be installed when service is provided from a transformer located “across the road” from the service location. Such handholes shall be located on lot lines, so that no service lateral will be located on any adjacent property.

H. Metering Pedestals

Metering pedestals shall be installed adjacent to the padmount transformer, handhole or pedestal connection box facing the street, whenever the service entry at the property will be more than 200 feet from a main access roadway or where house mounted meters cannot be located on driveway side of the house or as determined by the MMLD.

I. Streetlights

All streetlights shall be LED. Streetlights shall be located within each project as follows:

1. At the intersection of the subdivision road with the Town road.
2. At all road intersections within the subdivision.
3. At additional locations deemed necessary by the MMLD Board of Light Commissioners.

J. PVC Conduit and Accessories for Electrical Conduits

1. Conduits shall be sized per the National Electric Code with minimum sizes as follows:
 - a. Primary Conduit – 4 inch diameter
 - b. Secondary Conduit – 4 inch diameter
 - c. Streetlight Conduit – 2 inch diameter
2. Furnish Schedule 40 PVC conduit.
3. Furnish conduit straight and true in minimum 10 foot lengths.
4. Furnish conduit system with couplings, adaptors, end bells, sweeps, spacers, supports and all other accessories as required for a complete installation.

5. Furnish material and accessories supplied by the same manufacturer.
6. Furnish PVC conduits and fittings that are homogeneous plastic material free from cracks, holes, or foreign inclusions with a conduit bore smooth and free of blisters, nicks or other imperfections which could damage the cables.
7. Fittings: Self-sealing type or sealed with conduit manufacturer's approved sealing compound.
8. Spacers: Non-metallic interlocking type.
9. End Caps: Provided with pull tabs.
10. Manufacturers: Carlon, Condux or MMLD approved manufacturer.

K. RGS Conduit at Riser Pole and Box Pad Installations

Conduit for riser pole and box pad installations shall be rigid steel conduit (RGS), zinc coated in accordance with ANSI C80.1 and UL6.

1. 90 degree RGS conduit sweeps with a 36-inch minimum radius on each conduit at riser pole.
2. 4-inch RGS conduit on each riser pole to a minimum of 10 feet above grade and a minimum of 10 feet below grade from RGS conduit sweep.

L. Secondary Handholes

1. Handholes shall be of heavy duty, reinforced fiberglass construction or polymer concrete with structural fiberglass reinforced polymers and provided with skid resistant covers fitted flush to top of handhole base.
2. Covers and bases shall be provided with captive stainless steel bolts and self-centering nuts. Cover logo shall be "ELECTRIC".
3. Handholes shall be minimum size of 24"x36"x24" deep.
4. Color: Gray
5. Manufacturers: Carson-Brooks, Quazite-Composolite, or MMLD approved manufacturer.

M. Secondary Connection Pedestals

1. Secondary connection pedestals may be installed as an alternative to secondary handholes per MMLD approval.
2. Pedestals shall be heavy duty, reinforced fiberglass or high-density polyethylene construction, with minimum 12"x19" top dimension, 18"x18" base opening, 26.5"x26.5" bottom opening and 30" overall height.
3. Color: Willow Green
4. Manufacturers: Nordic Fiberglass Model PSP-151530 or MMLD approved manufacturer.

N. Secondary Meter Pedestals

1. Meter pedestals shall be steel type construction.
2. Manufacturers: Anchor Electric, Milbank or MMLD approved manufacturer.

O. Underground Conduit System

1. All primary conduits shall be encased in concrete with minimum 3,000 lb. concrete.
2. Secondary conduits installed under roadways and driveways may be either galvanized steel or concrete encased. All other conduits to be schedule 40 PVC concrete encased for primary system.
3. Where due to ledge or other problems, the specified depth of burial for primary conduit is unable to be obtained, the developer shall utilize galvanized steel conduit. In such cases, the conduit shall be installed to a minimum depth of 2'-0" and shall be concrete encased.
4. In all cases, the entire conduit system shall have Caution Tape placed 12 inches above either the conduit or concrete encasement.
5. Requirements for the installation of primary conduits is summarized in the following table:

Primary Voltage Conduit System		
Feature	Normal Installation	Shallow Installation
Conduit Type	Sch 40 PVC	RGS
Minimum Conduit Size	4"	4"
Minimum Conduit Sweep	24"	24"
Embedment Type	Concrete	Concrete
Minimum Burial Depth	48"	24"

6. Requirements for the installation of secondary conduits is summarized in the following table:

Secondary Voltage Conduit System			
Feature	Normal Installation	Shallow Installation & Roadways & Driveways	
Conduit Type	Sch 40 PVC	Sch 40 PVC	RGS
Minimum Conduit Size	4"	4"	4"
Minimum Conduit Sweep	16"	16"	16"
Embedment Type	Sand or Concrete	Concrete	Sand
Minimum Burial Depth	36"	24"	24"

7. Requirements for the installation of street lighting conduits is summarized in the following table:

Primary Voltage Conduit System	
Feature	Normal Installation
Conduit Type	Sch 40 PVC
Minimum Conduit Size	2"
Minimum Conduit Sweep	18"
Embedment Type	Sand
Minimum Burial Depth	24"

8. Trench Excavation and Backfill
- a. Stockpile excavated material suitable for use as backfill.
 - b. Remove unstable and unsatisfactory materials from the bottom of excavation.
 - c. Backfill over-excavated areas with suitable backfill materials generated in the work and approved by MMLD or suitable imported backfill materials.
 - d. Ensure excavations are kept dry and free of standing water.
 - e. Maintain side slopes of excavations in accordance with OSHA guidelines.
 - f. Furnish and install shoring and bracing conforming to OSHA guidelines where conditions require it.

- g. Ensure trench bottom soil is at optimum moisture content. Add water or allow soil to dry as needed.
- h. Proof compact trench bottom by making 2 passes with a vibratory plate compactor prior to installation of conduits.
- i. Ensure conduit installation is complete and inspected by MMLD prior to initiating backfilling operations.
- j. Do not backfill over, wet, frozen or unstable sub-grade surfaces.
- k. Maintain optimum moisture content of backfill materials to attain required compaction density.

9. Concrete

- a. Cement: ASTM C150, Type II; Portland type; gray white color.
- b. Fine and Coarse Aggregates: ASTM C33.
- c. Water: clean and not detrimental to concrete.
- d. Mix and deliver concrete in accordance with ASTM C9.4 – Specifications for Ready – Mix Concrete.
- e. Provide concrete for all project concrete work of the following characteristics:
 - 1) Compressive Strength (28 days): 3,000 psi
 - 2) Coarse Aggregate Size (maximum): ASTM C33 No. 57
 - 3) Air Entrainment: 5 percent
 - 4) Maximum Water Cement Ratio: 0.50
- f. Add air entraining agent to concrete mix for all concrete work.
- g. Place concrete in accordance with ACI 301 and ACI 304.

10. Concrete and Sand Encased Conduits

- a. Inspect all conduits before installation to ensure they are free from cracks, holes or foreign inclusions. Ensure the conduit bore is smooth and free of blisters, nicks, or other imperfections which could damage conductors or cables.
- b. Install conduit in not less than 10-foot minimum lengths, except at the end of a run or at bends.

- c. Make all field cuts of PVC conduit with a hacksaw. Make the cut square to the conduit axis. Ream the cut end smooth. Join field cut conduits with couplings designed for this purpose.
- d. Join all PVC conduits and fittings with a solvent cement in strict accordance with the manufacturers' recommendations or utilize self-sealing fittings.
- e. Make all field cuts of rigid galvanized steel conduit (RGS) with a device that will not damage the conduit. Ream all field cut ends to remove burrs and rough edges. Utilize unions to join lengths of RGS conduit where it is inconvenient to use standard couplings. Expansion couplings that expand the conduit diameter are prohibited from use.
- f. Install all conduits between riser pole and terminal box pads, between box pads or from box pads to handholes with a minimum slope of 2 inches per 100 feet or with a high point and a minimum slope of 2 inches per 100 feet.
- g. Maintain continuous earth support under conduits and make transitions in as straight an alignment as possible when changes in the formation of conduits in a duct run are necessary.
- h. Concrete Encasement
 - 1. Concrete envelopes shall be installed so that a minimum of 6 inches clearance is maintained from other subsurface utilities and structures.
 - 2. Support concrete encased conduits with plastic spacers placed at approximately every 5 feet along the route. Secure conduits and spacers together with non-metallic ties after installation to prevent floating of the ductbank during concreting operations.
 - 3. Form the vertical faces of the ductbank to shape the concrete to the specified dimensions.
 - 4. Raise the entire conduit assembly after the conduits, spacers, and reinforcing steel is in place and place on concrete or plastic blocks so that the concrete bed of specified depth is formed below the conduit assembly.
 - 5. Key or interlock construction joints in ductbanks if a complete run is not completed before hardening of the concrete begins.
 - 6. Ensure that all concrete is well spaded to completely fill voids between and beneath all conduits in the ductbank.
- i. Direct Buried Conduits
 - 1. Prepare trenches as described above.

2. Install direct buried conduits at a depth that will result in a minimum of 24 inches of native backfill cover over the sand backfill material.
 3. Place 3 inches compacted sand backfill under. And around and over direct buried conduits.
 4. Exercise extreme care in the placement of sand backfill around conduits to prevent foreign matter, dirt and concrete from entering conduits at couplings and terminations.
 5. Backfill above sand with native backfill.
- j. Plug the ends of all conduits at the end of each work day or when conditions require it to prevent water and debris from entering the conduits.
 - k. Pull a standard flexible mandrel, not less than 12 inches long and having a diameter approximately $\frac{1}{4}$ inch less than the inside diameter of the conduit, through each completed conduit. Replace all conduits that do not allow passage of the mandrel.
 - l. Pull a stiff brush through each completed conduit after the mandrel operation is complete to ensure that no particles of earth, sand, gravel or other foreign material has been left in the conduit.
 - m. Terminate conduits in box pads with end bells.
 - n. Plug both ends of all conduit runs with plastic inserts equipped with pull tabs.
 - o. Install a 3/16 inch, 500 lb. polypropylene or polyolefin rope or MMLD approved equal in each length of completed conduit and tie to the pull tab provided on the conduit plugs.

P. Box Pads

1. Prepare for installation of box pads by over-excavating at least 6 inches deeper than depth of box pads.
2. Stockpile excavated material suitable for use as backfill.
3. Remove unstable and unsatisfactory materials from the bottom of the excavation.
4. Install and compact a minimum of 12 inches of crushed rock in bottom of excavation for drainage purposes.
5. Install box pad per manufacturer's instructions.

6. Ensure conduits are properly exposed and terminated with end bells and box pad installation is complete prior to initiating backfilling operations.
7. Backfill over-excavated areas with suitable backfill materials generated in the work and approved by MMLD or suitable imported backfill materials.

Q. Secondary Connection Pedestals

1. Prepare for installation of pedestals by over-excavating at least 6 inches deeper than depth of pedestal.
2. Stockpile excavated material suitable for use as backfill.
3. Remove unstable and unsatisfactory materials from the bottom of the excavation.
4. Install and compact a minimum of 12 inches of crushed rock in bottom of excavation for drainage purposes.
5. Install pedestal per manufacturer's instructions.
6. Ensure conduits are properly exposed and pedestal installation is complete prior to initiating backfilling operations.
7. Backfill over-excavated areas with suitable backfill materials generated in the work and approved by MMLD or suitable imported backfill materials.

R. Meter Pedestals

1. Install meter pedestals in 18" of concrete.
2. Install meter pedestals so meter faces street.