Division of Technical Resources
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News to Use
Design Requirements Manual
The formulae $\frac{\partial \rho U_i}{\partial t}+\frac{\partial}{\partial x_j}(\rho U_i U_j)=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial U_i}{\partial x_j}\right)+g_i(\rho-\rho_0)$ for building $\frac{\partial}{\partial x_j}(\rho\overline{U_i}\overline{U_j})=-\frac{\partial \bar{P}}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial \overline{U_i}}{\partial x_j}-\rho\overline{u_i'u_j'}\right)+g_i(\rho-\rho_0)$ state of the art $\frac{\partial}{\partial x_i}(\rho\overline{U_i}\overline{H})=\frac{\partial}{\partial x_i}\left(\lambda\frac{\partial \overline{T}}{\partial x_i}-\rho\overline{u_i'h'}\right)$ biomedical research facilities.
'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'.
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Medium Voltage Electrical Distribution

Medium voltage (13.8 KV) electrical distribution systems supplies electrical power to various buildings in the National Institutes of Health (NIH) Bethesda campus. Medium voltage electrical distribution systems comprised of primary switch, oil filled network transformer, secondary network protector and primary feeder cables. General requirements for installation of medium voltage distribution systems in NIH Bethesda campus are outlined in the following paragraphs.

Primary Switch: The 15kV primary switch shall be load break type with three-positions: OPEN, CLOSED, and GROUND. The center position is the CLOSED one. Key-interlock this switch with the transformer tap-changer mechanism such that the switch shall be in the ground position before the transformer taps can be changed.

Network Transformer: The network transformers, without any forced air cooling, shall be capable of supplying 100% of the total building loads along with 25% future expansion loads. General requirements for the network transformers are as follows:

1. Coil Material: Copper.
2. Insulating Liquid: NIH approved less flammable natural ester.
3. Cooling: Class OA/FFA, self-cooled, and with provisions for future forced-air-cooled rating.
4. Accessories: Include the following additional accessories:
    a. Temperature gauges with re-settable maximum pointers.
    b. Sampling valves.
    c. High pressure release valves.
    d. Key-interlocked tap changer with five settings, one at primary voltage, the other four nominal 2.5 percent taps - 2 above and 2 below rated primary voltage.
    e. Alarm contacts for SCADA interface.

Medium Voltage Cable: All medium voltage cable installation shall meet the following requirements:

1. Cable Type: MV 105.
2. Conductor: Copper, single conductor.
3. Insulation: Ethylene-propylene rubber (EPR).
    a. Voltage rating: 15 KV.
    b. Insulation Level: 133% insulation level.
    c. Strand screen: Extruded semiconducting EPR meeting or exceeding the electrical and physical requirements of ICEA S-68-639, AEIC CS8, and UL 1072.
    d. Shielding: Copper tape, 5 mil thick, helically applied with a 12.5% overlap.
    e. Cable Assembly: Three insulated, shielded conductors cabled together with a ground conductor.
    f. Cable Jacket: Sunlight-resistant polyvinyl chloride (PVC).
    g. Cable Size: 350 KCMIL or 500 KCMIL (sizes only for ease in maintaining NIH short circuit study and possible medium voltage feeders serving multiple buildings). 500 KCMIL is preferred for new construction in the NIH Bethesda campus.

Above-mentioned paragraphs highlighted some of the major requirements of the NIH design requirement manual (DRM). Refer to the DRM for additional requirements.