APPLICATION OF WATER STREAMS ON ENERGIZED ELECTRICAL EQUIPMENT

1. INTRODUCTION

The Department in conjunction with Con Edison has developed a protocol for controlling fires on energized electrical equipment. The intention is to prevent collateral damage and the further loss of power extending to other areas of the city. This protocol provides for the safe application of water by large caliber stream devices to protect exposed electrical equipment.

2. PURPOSE

2.1 The FDNY will be called on to operate at fires involving transformers and other electrical components at Con Edison facilities. If electrical equipment in proximity to the burning equipment is damaged due to exposure to flames or heat, catastrophic damage could occur and jeopardize the electrical supply to large geographical areas of the city. The purpose of applying water streams to exposed electrical components is to prevent collateral damage to the surrounding equipment. Electrical equipment that is or has been involved in fire has no useful value and is replaced by Con Edison. The priority of water stream application is to minimize damage to unaffected adjoining components. Handlines shall never be used on energized electrical components at Con Edison facilities.

3. CON EDISON TERMINOLOGY

3.1 Con Edison classifies electrical equipment at their facilities as follows:

- Energized - Equipment that is connected to an electrical source.
- De-energized - Equipment that is isolated from all electrical sources but not grounded.
- Grounded - Equipment that is electrically isolated and grounds applied.

3.2 The procedures as outlined in this bulletin pertain to all electrical equipment whether it is Energized, De-Energized, or Grounded.

4. RESPONSE PROTOCOL

4.1 Units assigned on the initial alarm shall respond in accordance with Addendum 1 to this bulletin “FDNY Emergency Response Procedures at Con Edison Generating Systems.”

4.2 The decision to apply water streams to electrical components at Con Edison facilities will not be undertaken by first responding units. This decision can only be made by a Chief Officer above the rank of Deputy Chief (or a Deputy Chief operating as Car 421 or Car 422) in consultation with the Con Edison White Hat at the scene.
5. OPERATIONS

5.1 Prior to commencing the application of water streams onto energized electrical components, the Incident Commander must determine the maximum voltage potential for the facility from the Con Edison White Hat.

5.2 Once the maximum voltage potential for the facility is known, safe operating distances must be determined based on the type of water stream to be used.

5.3 The following are the minimum safe operating distances for applying water on energized or de-energized electrical components:

♦ 15 feet on live 138 kV electrical components for 30° or greater fog streams.
♦ 75 feet on live 138 kV electrical components for all straight or solid streams and streams less than 30° fog. This distance is equal to approximately one and one-half (1½) lengths of hose.
♦ 25 feet on live 345 kV electrical components for 30° or greater fog streams. This distance is equal to approximately one-half (½) length of hose.
♦ 125 feet on live 345 kV electrical components for all straight or solid streams and streams less than 30° fog. This distance is equal to approximately two and one-half (2 ½) lengths of hose.

NOTE: These minimum safe operating distances are from the tip of the nozzle to the nearest energized electrical equipment in the direction of the stream.

5.4 The primary means of applying water to energized electrical components is through the use of a Tower Ladder. When using a Tower Ladder the following procedure shall be adhered to:

5.4.1 Clear all sediment from the water supply by flushing the hydrant thoroughly before connecting to the pumper.

5.4.2 The type of tip to be used on the Tower Ladder is dependent on the ability of the stream to reach the target area. All Tower Ladder Companies are equipped with stacked tips to supply a solid stream and the Akron Turbomaster Nozzle which has an adjustable stream pattern from straight to fog position.

5.4.3 The waterway of the Tower Ladder must then be flushed away from the point of operation and all electrical components for several minutes until the water runs clear.

5.4.4 Attach the selected tip to the basket mounted stang. If using the Akron Turbomaster Nozzle, set the desired stream pattern. The basket mounted stang is then set to the desired angle and locked in place.
5.4.5 The safe operating position for the apparatus will be determined in conjunction with Con Edison personnel. Once determined, all members are removed from the basket and the basket is then raised to operating position. All members are then removed from the apparatus. The stream will then be applied to the target area.

5.4.6 If the stream is not reaching the intended target area then the water supply must be shut down at the pumper and the position of the basket or the angle and/or pattern of the stream must be adjusted. Once the basket is repositioned, and all members are off the apparatus, water is again supplied to the Tower Ladder.

NOTE: When the stream is re-positioned, ensure that the minimum safe operating distance for the type of stream employed is maintained.

5.5 If conditions don’t allow for the use of a Tower Ladder, consider the feasibility of using an Engine Apparatus Deck Gun, the ladder pipe on an Aerial Ladder, or a portable Akron New Yorker Multiversal.

NOTE: The Aquastream Master Stream Nozzle carried by all Aerial Ladder and Engine Companies is factory pre-set to a fog stream pattern of 130 degrees. This nozzle shall not be used because it does not provide enough stream penetration to allow for maintaining safe operating distances.

5.6 Entry of members or the placement of any apparatus or appliance within the property line of any Con Edison facility shall only be with the approval of the Con Edison White Hat and escorted by Con Edison personnel. Con Edison personnel will ensure that members enter, leave, and operate at safe distances from any of the hazards that can be present at such facilities. Members shall follow all directions of the Con Edison personnel while inside Con Edison facilities.

5.6.1 Confirm all FDNY equipment inside the Con Edison property line is connected to the facility’s station ground grid prior to applying water. Con Edison maintains approved grounding cables at their sites. Con Edison personnel shall connect the grounding cable to the facility’s station ground grid and to such FDNY equipment.

6. BACKGROUND

6.1 Minimum safe operating distances were determined with on-site testing conducted by the Department and Con Edison at Con Edison facilities. A current leakage of 0.9 milliamperes (mA) is the lowest current flow that could be detectable to a person, and it would be felt as a slight tingle. This level (0.9 mA) was set as the maximum safe level for operation of a water stream onto energized electrical equipment. The following table shows the effects of various levels of current applied to the human body:
### Physiological Effects of Electric Current

<table>
<thead>
<tr>
<th>Current Magnitude (ma)</th>
<th>Physiological Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 0.9</td>
<td>Not Noticeable.</td>
</tr>
<tr>
<td>0.9 – 1.2</td>
<td>Only felt at point of contact.</td>
</tr>
<tr>
<td>1.2 – 1.6</td>
<td>Slight tingling sensation in hand.</td>
</tr>
<tr>
<td>1.6 – 6.0</td>
<td>Shaking and feeling of cramp (with some people pain), first in the wrist and lower arm, and finally in the shoulder.</td>
</tr>
<tr>
<td>6.0 – 8.0</td>
<td>Hands stiff and cramped, difficulty in releasing electrode.</td>
</tr>
<tr>
<td>13.0 – 15.0</td>
<td>Pain hardly bearable, and release only possible with great effort.</td>
</tr>
<tr>
<td>Over 15.0</td>
<td>Release impossible.</td>
</tr>
<tr>
<td>Over 20.0</td>
<td>Generally injurious to health if heart lies in current path.</td>
</tr>
<tr>
<td>50 – 100</td>
<td>Lower limit of fatal effect.</td>
</tr>
</tbody>
</table>


### SAFETY CONSIDERATIONS

7.1 FDNY members shall never enter inside the Con Edison facility property line unless escorted by qualified Con Edison station personnel and with the approval by the Incident Commander.

7.2 Con Edison personnel shall confirm that all FDNY equipment inside the Con Edison property line is connected to the facility’s station ground grid.

7.3 Only fresh water shall be used for applying water streams on live electrical components. Salt water shall never be used.

7.4 Clear all sediment from the water supply by flushing the hydrant thoroughly before supplying the pumper apparatus.

7.5 The hose and appliance must be flushed clear of sediment and scale before applying the stream onto the exposed electrical equipment. Sediment or minerals in the water may increase electrical conductivity and carry current back to the tip through the water stream.

7.6 No additives including any type of foam shall be used. Additives increase the electrical conductivity of the water.

7.7 Fog streams are poor conductors of electricity and are therefore the preferred water stream pattern. The desired fog pattern mode is a 30 degree or greater fog stream.

7.8 Fog streams can be greatly affected by wind conditions and may not reach the target area from a distance of fifteen or twenty-five feet. In these situations, a straight stream utilizing the fog tip or a solid stream shall be used and the stand-off distances increased as per section 5.3.
7.9 Members shall not touch, move, or adjust any part of the large caliber stream device while it is delivering a water stream to energized electrical components.

7.10 Con Edison personnel will be present to ensure that members and equipment maintain the required minimum safe operating distances from energized electrical equipment.

7.11 The possibility of run-off water from a Con Edison facility being charged with electrical current is extremely remote. All Con Edison facilities have station grounding mats installed that would absorb any stray electrical currents and prevent pools of water outside the facility from being charged. However, avoid low spots when positioning apparatus and appliances. Members should also avoid water run-off.