Hawaiian Electric

The information found in this document are general guidelines that may be used to aid in the preparation of your service request proposal. Please be advised that depending on the specific needs and actual conditions of your project, Hawaiian Electric may require your design to comply with different specifications including specifications that include more stringent requirements than those included in these design specification guidelines. For further guidance and clarification on the actual specifications that will apply to your particular project, please refer to instructions issued by Hawaiian Electric's Planner or Engineer who is assigned to your particular (Project/Review Request/…). Additionally, please be advised that Hawaiian Electric reserves the right to require additional modifications to any approved design if it is determined during actual construction that additional modifications must be made to address certain field conditions that were not detected or Hawaiian Electric was unaware of during the design review process.

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GUIDE FOR THE LOCATION OF PADMOUNTED TRANSFORMERS AND EQUIPMENT

Location:

1. The preferred location of padmounted transformers and equipment is at the front of the property facing the public roadway and outside of fences, walls, etc. to facilitate ease of access and operation of equipment by HECO/MECO/HELCO personnel.
2. If the pad(s), transformer and/or switch gear cannot be located fronting the public roadway and must be located within private property, then HECO/MECO/HELCO shall require a 10'-0" wide minimum path for vehicular access to the pad-mounted equipment to facilitate replacements and/or maintenance of units, cables, terminations, etc. HECO/MECO/HELCO shall have 24 hour access to it's equipment. All access shall be provided and maintained without the need for entering locked areas.
3. Combustible materials, combustible buildings and parts of buildings, fire escapes, door and window openings shall be safeguarded from oil insulated transformers as outlined in Paragraph 450-27 of the National Electric Code, latest revision, subject to City and County building inspectors.
4. The transformer shall be installed in a location that shall not violate the Department of Health noise requirements.
5. Locate concrete pad(s) for the transformer and/or equipment so no permanent or temporary structure or object shall be erected or placed within the indicated clear space. All clear space shall be relatively level and clear of any obstructions at all times. This includes but is not limited to walls, fences, plants, shrubs, and debris. Clear space allows cabinet doors to open and HECO/MECO/HELCO personnel to operate equipment with hot stick tools. In addition, the clear space permits access to all sides of the equipment for maintenance and/or replacement.

   A. Transformers: Clearance is measured from the corresponding edge of the pad due to dimensional variations of each transformer tank.

      1. Front clearances of transformers:
         a. For 1000kVA and larger transformers (ref. 30-5015 & 30-5017), and 500 & 750kVA transformers (ref. 30-5010 & 30-5014): 6'-0" for 15kV and 8'-0" for 25kV. In general, front clearances are required for hot-stick operation and testing of transformers. Typical hot-stick length is approximately 6'-0" for 15kV and 8'-0" for 25kV and 2'-0" is required for the switching motion of the operator. Minimal clearances in front of the transformer for safe operation are 8'-0" for 15kV and 10'-0" for 25kV, which should normally be satisfied by the clearances stated measured from the front of the transformer pad.
         b. The drawings of transformer pads and clearances on the following pages are generic in nature. The clear space zone that is defined should be adhered to. The placement of stanchions or barriers as required will be dependent upon the conditions/environment that is fronting the transformer, and shall be placed to maintain the defined clear space zone.
      2. Side and rear clearances of transformers:
         a. For transformers without easements:
            2'-6" clearance measured from the side edges of pad and 2'-0" clearance measured from the rear edge of the pad to any permanent or temporary structure(s). This clearance is required for unit removal, maintenance of the unit, and the cooling of the unit.
            If the building has an overhang the pad shall be placed at minimum 2'-6" from the edge of the overhang.
         b. For side and rear clearances of transformers with easements:
            The clear zone in rear and sides will be the easement area. Easement area should be negotiated to fulfil the requirements as specified for transformers without easements.

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	11-9-02	CT MM JK

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3. Overhead clearances of transformers:
   a. For all transformers: 9'-0" height clearance minimum measured from the pad grade. Maximum fuse height for transformers is 5'-4" and an additional 3 feet is needed for fuse replacement and cooling. Unit replacement should also be considered. If other vault equipment needs to be moved over such equipment, additional clearance above is required and these situations need to be handled on a case by case basis.

B. Switchgear: Clearance is measured from the equipment rather than the pad due to minimal dimensional variations of the switchgear.
   1. Manual switchgear
      a. Front and rear clearances of switchgear:
      8'-0" for 15kV and 10'-0" for 25kV to allow for opening of cabinet doors for hot-stick operation and testing of switchgear (typical hot-stick length is approximately 6'-4" for 15kV and 8'-4" for 25kV and 2'-0" is required for the switching motion of the operator).
      b. Side clearances of switchgear:
      3'-0" measured from the edge of equipment to any permanent or temporary structure. This clearance is required to aid in the switching operation and maintenance of unit.
      c. Overhead clearances of switchgear:
      For all equipment: 9'-0" height clearance minimum measured from the pad grade shall be required. If other vault equipment needs to be moved over such equipment, additional clearance above is required and these situations need to be handled on a case by case basis.
   2. Auto-transfer switchgear
      a. Front and rear clearances of switchgear:
      8'-0" for 15kV and 10'-0" for 25kV to allow for opening of cabinet doors for hot-stick operation and testing of switchgear (typical hot-stick length is approximately 6'-4" for 15kV and 8'-4" for 25kV and 2'-0" is required for the switching motion of the operator).
      b. Side clearances of switchgear:
      For PMH units 3'-0" clear space required to allow cabinet doors to open for the AT (Automatic transfer) side and 2'-6" for the non-AT side. For the PME units the AT units are on both sides and requires 4'-6" clear space on each side to allow cabinet doors to open.
      c. Overhead clearances of switchgear:
      For all equipment: 9'-0" height clearance minimum measured from the pad grade shall be required. If other vault equipment needs to be moved over such equipment, additional clearance above is required and these situations need to be handled on a case by case basis.

Barriers for Vehicular Traffic:

Post barriers or stanchions:

1. When padmounted transformers and/or equipment are located in areas that are subject to vehicular traffic, which includes parking lots and curb-less sidewalks, post type barriers shall be specified by HECO. The post barriers shall be supplied and installed by the customer.
   a. Parking lots and private roads require post barriers:
      i. When vehicular traffic will pass within 5 feet or less of the equipment and is upon a standard 7" curb.
      ii. When equipment is at the same grade and is less than 12 feet from the roadway.
2. Post barriers shall be painted Yellow per ANSI spec Z535.1 to comply with OSHA 1910.144 for color coding. A 2" wide strip of reflective tape shall be placed 6" below the top of post.

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3. Post barriers height shall be at a minimum of 3'-6" above ground level for visibility to vehicular traffic.

4. Post barriers will be removable for the front of the equipment to facilitate maintenance, operation and installation of equipment. Additional removable barriers may be required to further ease installation and removal of equipment.

5. Post barriers shall have a maximum separation of 3'-6" to prevent automobiles, trucks, forklifts and other vehicles from contacting HECO equipment. Post barriers used in multi-family residential areas may have an increased spacing of 5'-0" maximum between posts. Intended for low speed areas (10 mph) in private roadways.

6. All barriers shall be installed outside clear zones. The only exception for reduced barrier positions is when front clear space is shared by the roadway. The front barriers can be placed up to 4 feet min. from pad (for tsf) and equipment (for switchgear) to allow cabinet doors to open. Roadway will allow HECO personnel to operate equipment with the required 8'-0" clearance. Parking stalls are not considered part of roadway. Regardless of the post barrier locations all clear zones shall be maintained.

7. Other permanent objects such as light posts, group mailboxes, hydrants, fence posts, etc., may serve as a form of protection. (Verify that these items are not encroaching on the clear space.) Trees or bushes are not a form of permanent barrier.

Curb Barriers:

1. Minimum distance from curb to transformer pad or to switch gear is 5 feet. Reversing trucks and vans have a typical dimension from rear wheel to end of vehicle of 5 feet or more.

2. Precast or poured-in-place concrete curb shall be used. See sheet 5.

3. Space between curb and pad shall be filled with either concrete or gravel. If gravel is used, drainage is required.

4. Intended for use in residential areas. Industrial or commercial areas shall have post barriers as protection for HECO Equipment.

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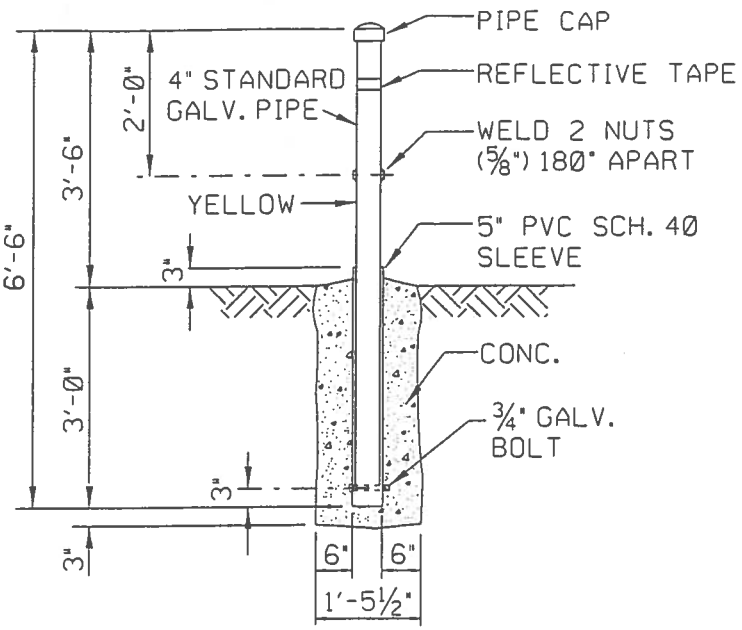
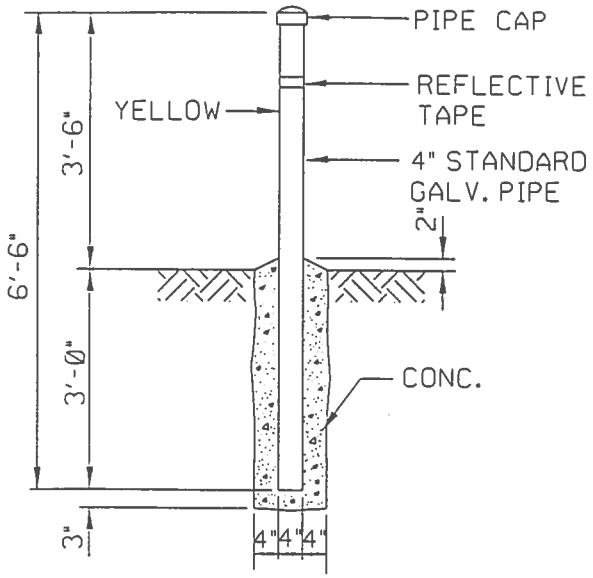


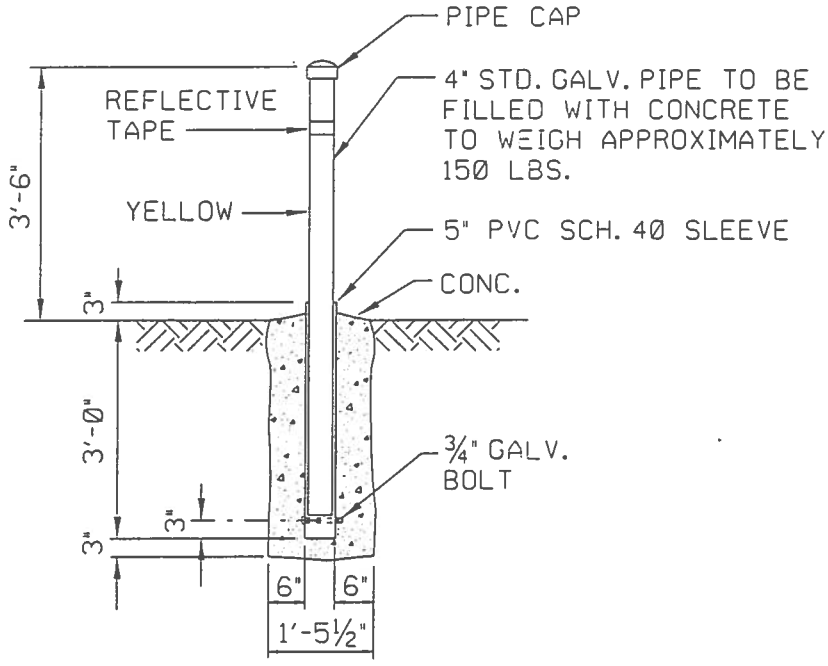
DETAIL A

PLACED IN FRONT AND ALSO TO THE RIGHT OF THE EQUIPMENT DOORS. THIS ALLOWS FOR SWITCHING AND BAYONET FUSE REPLACEMENTS. SHALL NOT BE FILLED WITH CONCRETE. WELDED NUTS ARE FOR INSERTING BOLTS TO ACT AS "HANDLES" FOR LIFTING BARRIER. THE BOLTS ARE TO BE REMOVED AFTER INSTALLATION.



DETAIL C

PERMANENT NON-REMOVABLE NON-CONCRETE FILLED POST BARRIER. INTENDED FOR THE REAR OF EQUIPMENT WHEN ACCESS IS FROM THE FRONT.



DETAIL B

REMOVABLE CONCRETE FILLED POST BARRIER. INTENDED TO ALLOW ACCESS FOR HECO LINE TRUCKS, CRANES OR FORKLIFTS, FOR THE THE REPLACEMENT OF UNIT.

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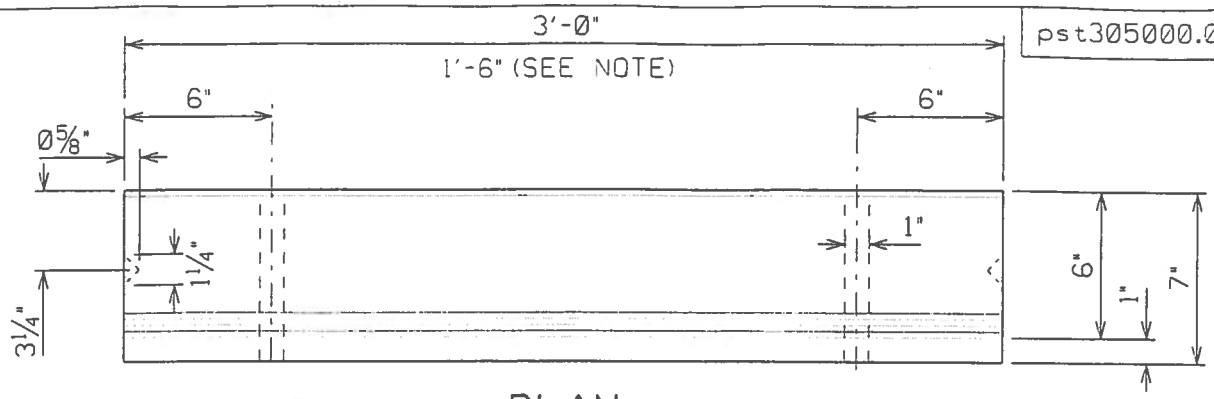
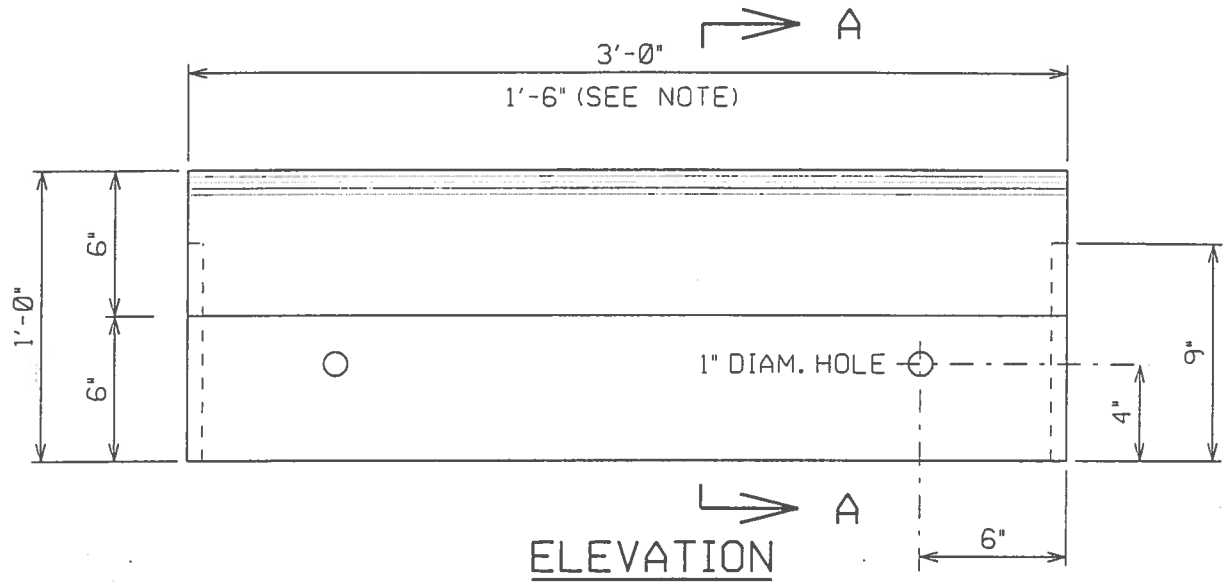


PLAN



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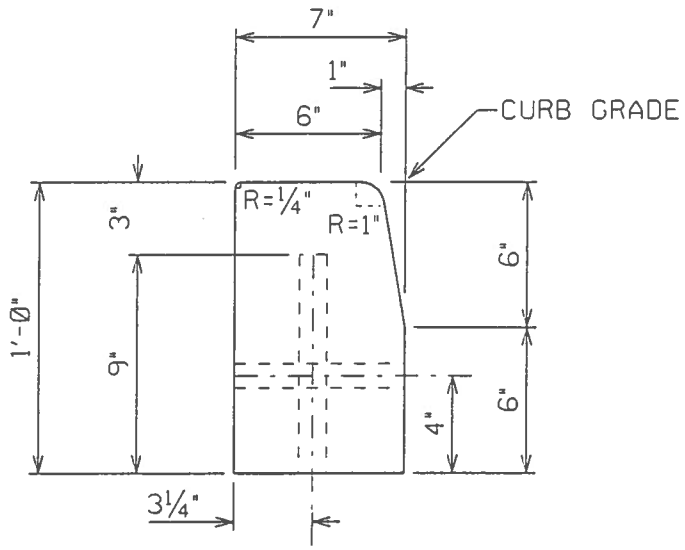

SECTION A-A

NOTE:
FOR CURB RETURNS USE 1'-6" PRE-CAST CONCRETE CURBS.

PRE-CAST CONCRETE CURB

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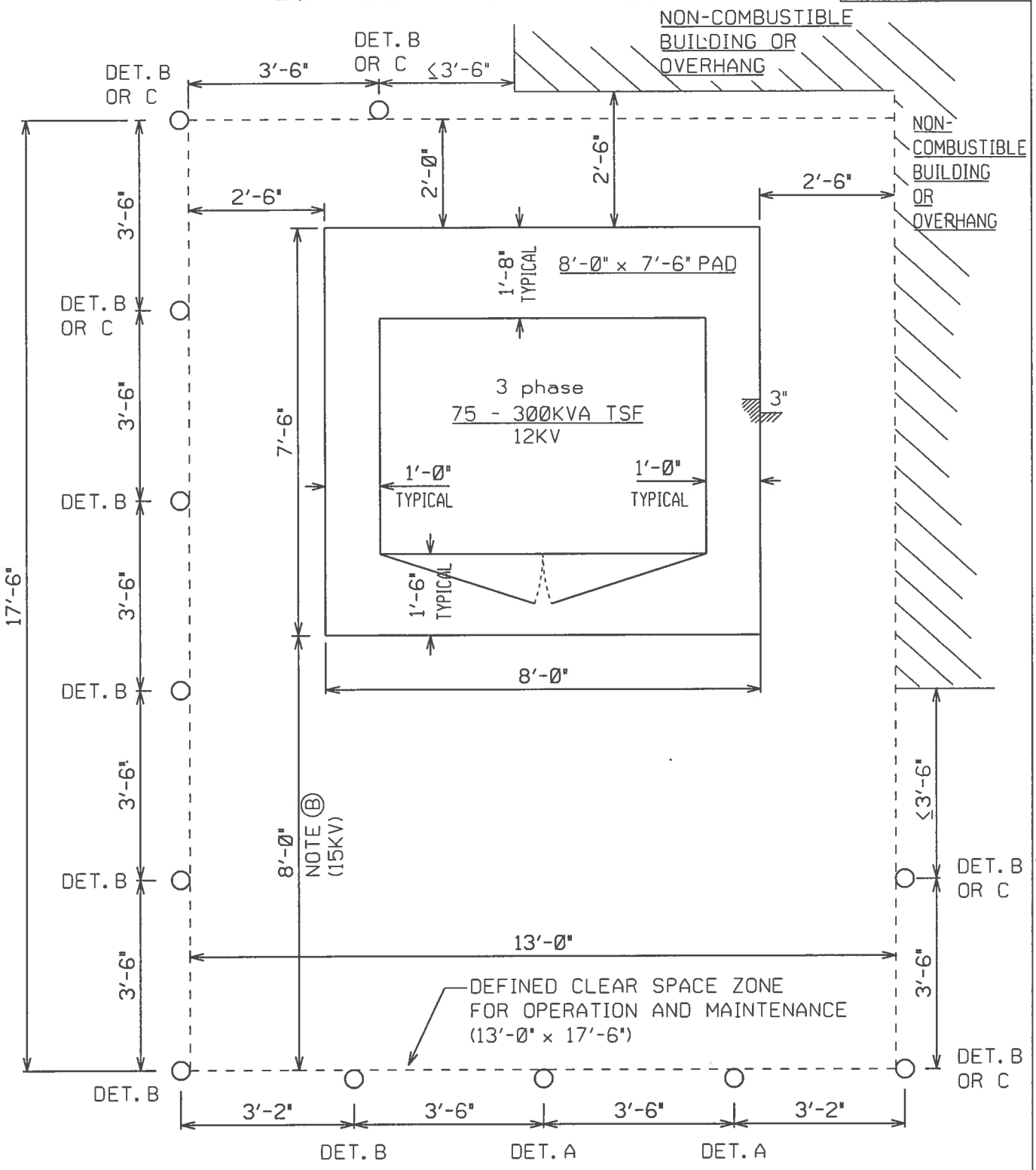
3 phase 12KV 75-300KVA TRANSFORMER



VEHICULAR ACCESS/ROADWAY OUTSIDE CLEAR ZONE

NOTES

Ⓐ HANDHOLES MAY BE REQUIRED FRONTING THE TRANSFORMER.

Ⓑ FOR 25KV OR 12x25KV UNITS, A 10'-0" CLEAR SPACE IS REQUIRED IN FRONT OF TRANSFORMER.

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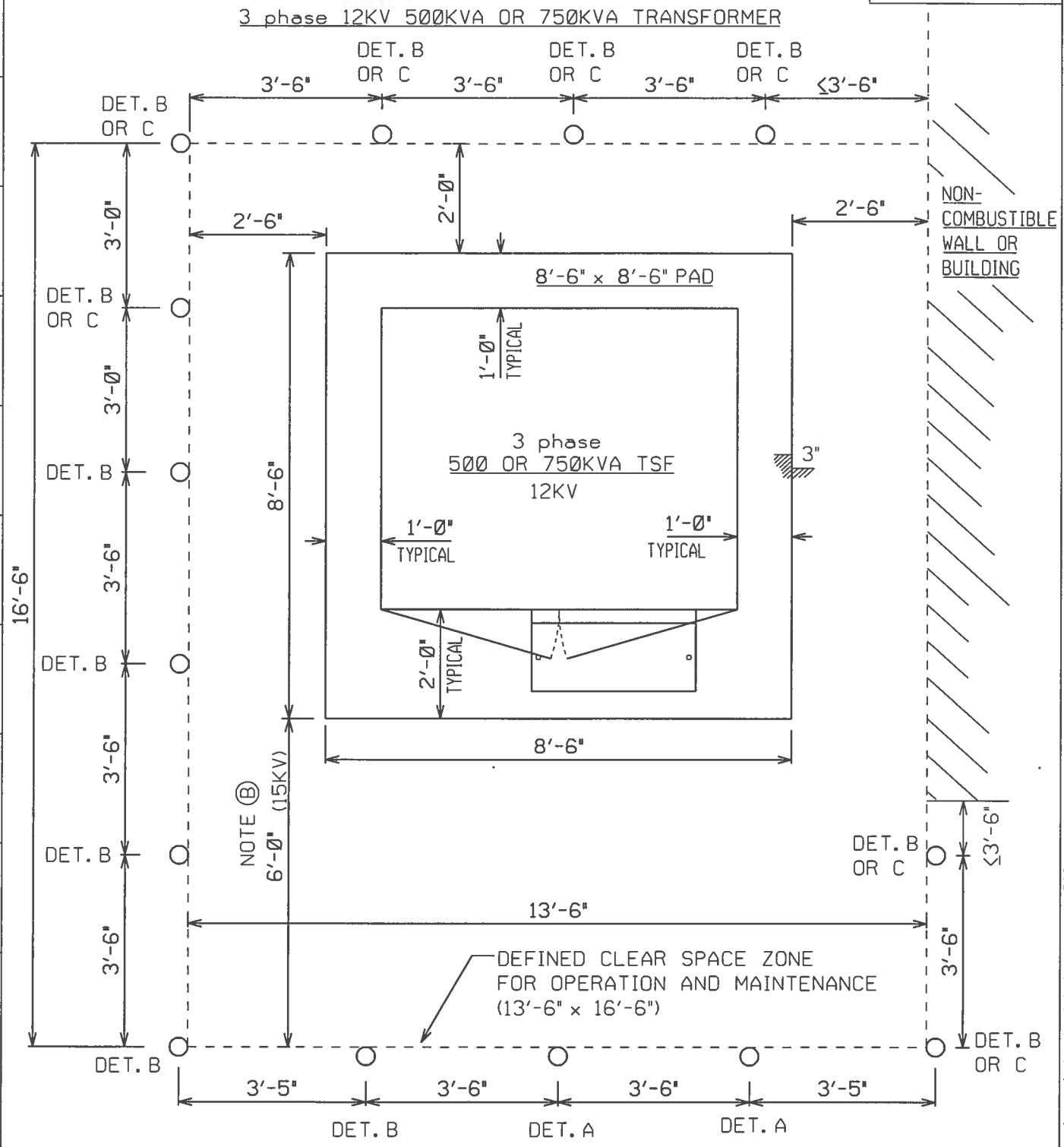

VEHICULAR ACCESS/ROADWAY OUTSIDE CLEAR ZONE

NOTES

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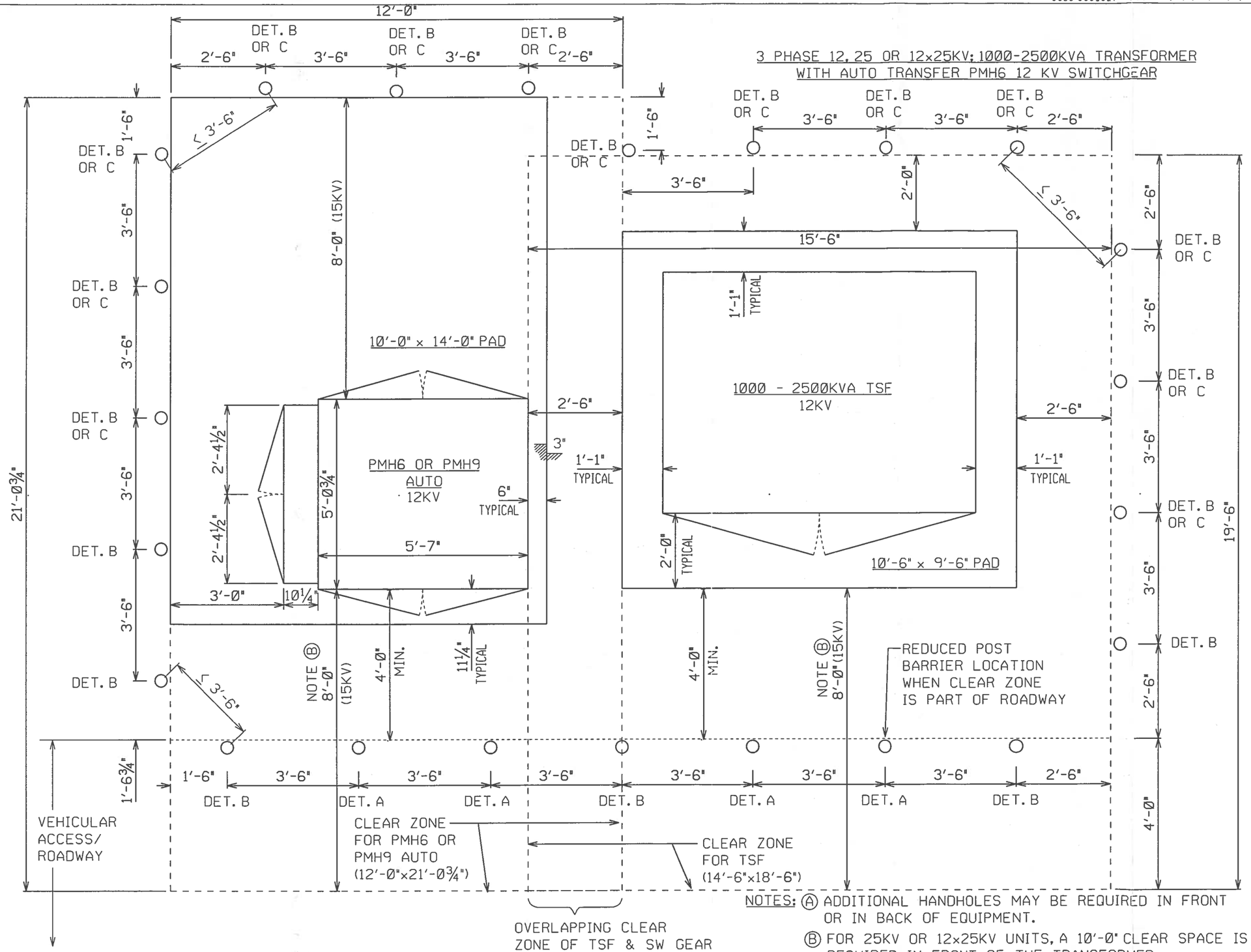
3 PHASE 12, 25 OR 12x25KV; 1000-2500KVA TRANSFORMER WITH AUTO TRANSFER PMH6 12 KV SWITCHGEAR



NOTES: Ⓐ ADDITIONAL HANDHOLES MAY BE REQUIRED IN FRONT OR IN BACK OF EQUIPMENT.

Ⓑ FOR 25KV OR 12x25KV UNITS, A 10'-0" CLEAR SPACE IS REQUIRED IN FRONT OF THE TRANSFORMER.

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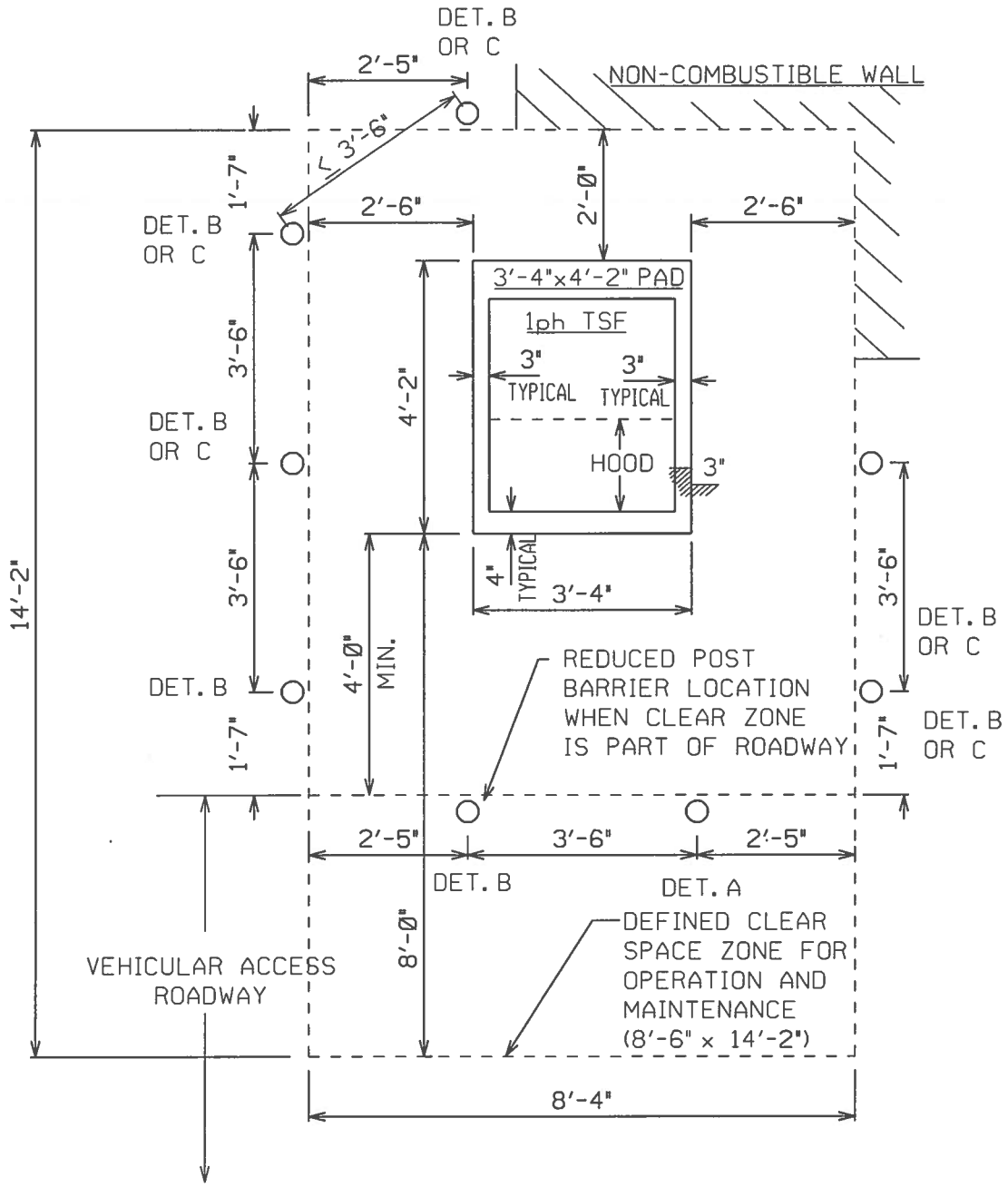
1 PHASE TRANSFORMER IN COMMERCIAL AREAS



VEHICULAR ACCESS/ROADWAY INSIDE CLEAR ZONE

NOTE: HANDHOLE IN FRONT OF THE TRANSFORMER NOT SHOWN.

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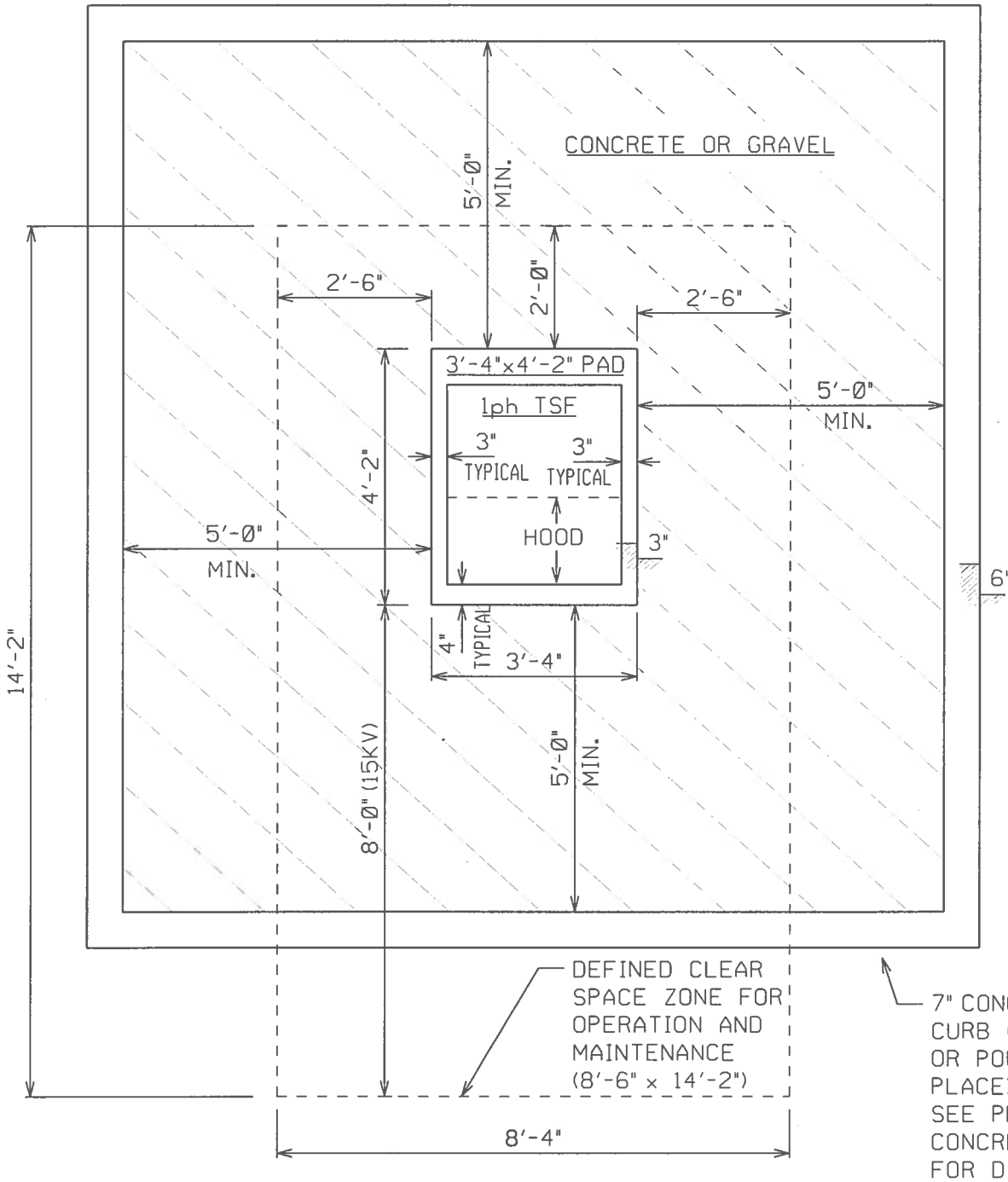
1 PHASE TRANSFORMER IN COMMERCIAL AREAS



VEHICULAR ACCESS/ROADWAY OUTSIDE CLEAR ZONE

NOTE: HANDHOLE IN FRONT OF TRANSFORMER NOT SHOWN

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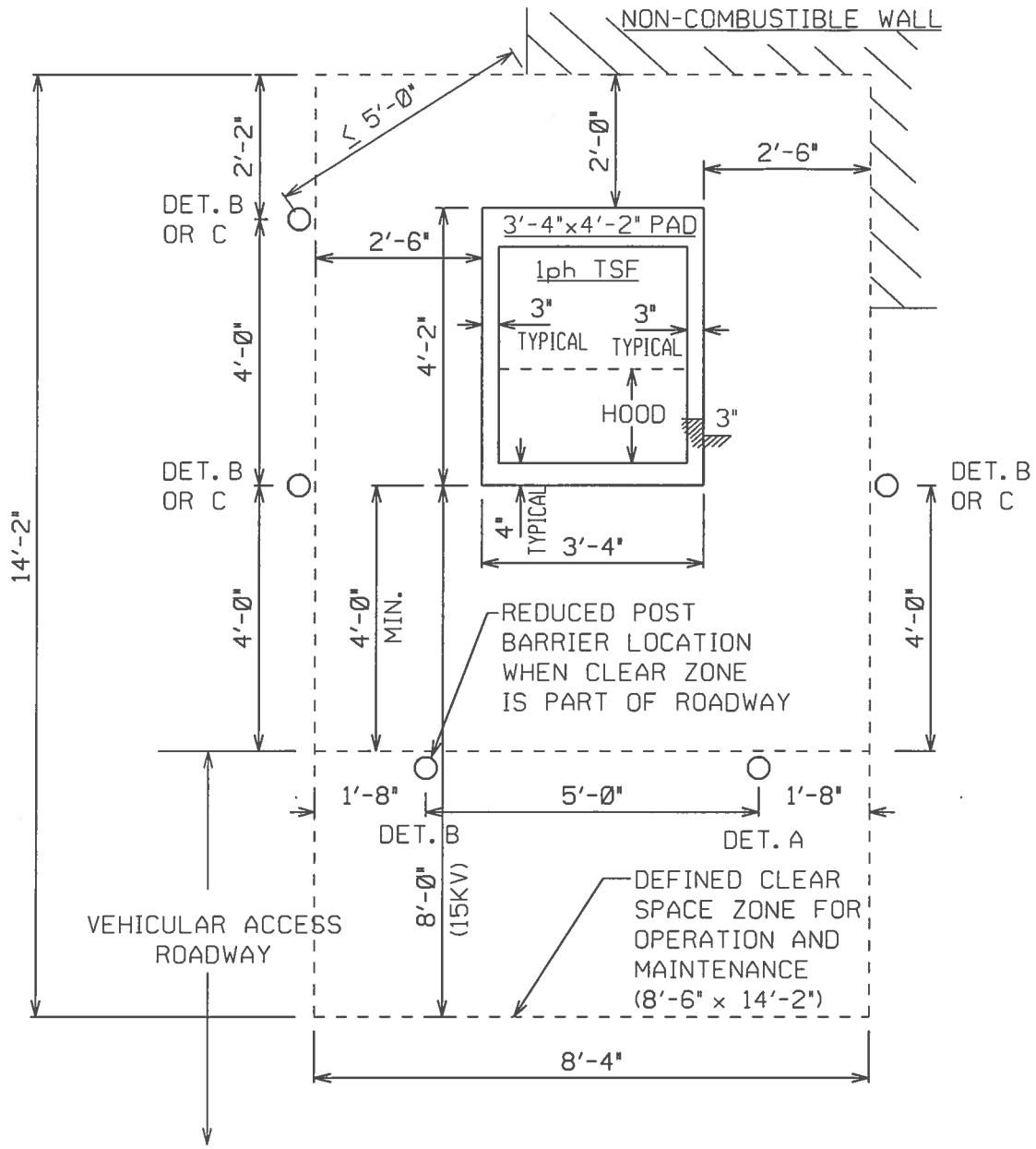
1 PHASE TRANSFORMER IN A MULTI-FAMILY RESIDENTIAL AREA



VEHICULAR ACCESS/ROADWAY INSIDE CLEAR ZONE

NOTE: HANDHOLE IN FRONT OF THE TRANSFORMER NOT SHOWN.

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