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Association

Permit Area Guide

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Note: *This guide replaces the Guide to Principles for Permit Areas September 2014 and Guide for Marking Equipment for Access for Work August 2013*

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This guide has been prepared by representatives of the electricity supply industry to provide guidance on safety practices for use by the industry.

This guide has been prepared on the basis that the user will be appropriately trained, qualified, authorised, and competent.

Status of Examples and Case Studies

Examples, including sample processes, or case studies in this guide are included to assist with consideration of health and safety issues. The examples or case studies are not a comprehensive statement of matters to be considered, nor steps to be taken, to comply with any statutory obligations pertaining to the subject matter of this guide.

Preface

The original '*Guide for Permit Areas*' was first produced in July 2006 and the related '*Guide for Marking Equipment for Access for Work*' first produced in November 2007.

The previous guides have been reviewed and updated with the key changes for this guide being:

- combine both guides into one document.
- general review of language, references, text
- updated to be compliant with Safety Manual – Electricity Industry (SM-EI)

The content of this guide will be monitored and revised periodically. Suggestions for changes should be sent to admin@eea.co.nz Electricity Engineers' Association, P O Box 5324, Wellington, 6145. www.eea.co.nz

Purpose

This guide provides industry good practices on the principles and requirements for the application and the management of permit areas in Switchyards and Stations as defined in the SM-EI.

This guide also includes the good practices relating to the signage requirements that can be used within permit areas of Switchyards and Stations to define the work being undertaken within the permit area.

Background

The marking of permit areas in switchyards by means of permit rope has been a requirement within the Electricity Supply Industry (ESI) after incidents where live equipment was inadvertently accessed with fatal consequences.

As a result of a fatal accident at Haywards substation in 2003, the definition of '*Permit Rope*' was amended in the *2004 issue of SM-EI* to include an appropriate marker other than only rope.

The marking used must be understood and consistent across all sectors of the ESI to achieve the desired outcome of a safe workplace for all workers.

Scope

This guide relates to the setting up and monitoring of work areas within Switchyards and Stations to provide defined boundaries inside of which work on equipment may be carried out.

Hazards will still be present inside the defined boundary but will be controlled by the relevant '*Worksite Safety Plan*' and the appropriate '*Work Management*' process.

Defined Permit areas do not apply to towers and poles.

Acknowledgements

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1. Principles of Permit Areas

A permit area is a temporary, defined area within a substation, switchyard or station where it is required to identify equipment intended to be worked on under an access or test permit. Permit areas are not required for work on poles and towers etc.



Figure: 1 Example of a permit area

- A permit area is an issuer applied safety measure; therefore, it is an instruction provided by the issuer as part of the switching instructions.
- A permit area shall be placed by a competent person, a person with issuer or permit recipient competence e.g. issuer, operator or the proposed permit recipient.
- The permit area shall be marked only with a distinctive marker using combination of yellow and green stripes and preferably continuous.
- Before and during the work the recipient shall ensure that all required work management and SM-EI processes are adhered to including a work site safety plan.

The purpose of a permit area and boundary markers within a switchyard or station is to identify the designated area where equipment is under an access or test permit, and thereby distinguish that area from the remainder of the switchyard or station.

A permit identifies:

- **to the recipient** the designated area or equipment which they must focus on for hazard identification and risk management purposes,
- **to workers** the location of equipment that has been prepared for work to be carried out under the permit and, and the defined entry point(s),
- **to other workers** within the switchyard or station that an access or test permit is in force on equipment bounded by the permit area.

1.1 Live Equipment within Permit Areas

Because the permit area identifies an area within a station or switchyard, there can be equipment within the area which is not the subject of the permit.

Examples include:

- a live bus above a transformer, circuit breaker, etc.
- a live bus within switchgear.
- live underground cables.
- a live bus above or below an isolated bus.
- live components below an isolated bus.

Any live equipment within a permit area, including live equipment at height, that can be inadvertently accessed by employees shall be clearly identified and marked or barriered to ensure that workers cannot access that equipment.

Safety measures and warning notices may need to be applied by the recipient to identify remaining hazards within the area and shall be recorded as Recipient applied safety measures. More details on these safety measures are in Section 7.

2. Definitions

Issuer	A competent worker who issues, modifies, receives back, transfers, or cancels access permits and test permits. The issuer also sends and receives assurances.
Issuer applied safety measures	Safety measures applied by, or on behalf of the issuer before and access permit or test permit is issued and removed once an access permit or test permit has been cancelled.
MAD	Minimum approach Distance as defined in NZECP 34:2001, New Zealand Code of Practice for Electrical Safe Distances.
Permit Boundary Marker	Yellow and green marker used at stations solely for the purpose of defining the boundaries of permit areas. In switchyards, the marker shall be continuous. e.g. rope, tape, chain
Permit Area	A defined area where there is equipment under an access permit or test permit, the boundary of which is identifiable by continuous markers. The equipment within the area may be in any state (e.g. live, de-energised or isolated).
Recipient	A competent worker who receives, holds, may request transfer of, and returns, an access or test permit.
Recipient applied safety measures	Additional safety measures applied by the work party after the access permit or test permit has been accepted.
Station	A general term to cover substations, power stations switching stations. The term does not apply to ground mounted distribution substations, pole mounted substations, reclosers, disconnectors and sites of a similar nature.
Switchyard	A restricted area, enclosed by a security fence or other secure boundary, containing normally live conductors and/or other exposed live equipment.

3. Setting up a Permit Area

3.1 Permit Area Marking

A permit area shall be set up using a continuous green/yellow marking system, the marker is generally in the form of a non-conductive rope or chain, but any other format is acceptable provided the green and yellow stripe format is maintained.

Examples of boundary markers:



Stranded rope coloured green and yellow



Adhesive or magnetic tape



Extendable safety barriers



Figure: 2 Examples of boundary markers

Permit area signs shall be placed around the outside of the permit area facing outwards to indicate that the permit area is the area inside the permit area boundary marker. The signs should not be suspended from the permit area boundary marker but can be on the boundary marker supports.

A permit area should be established to be as compact as practicable, while ensuring sufficient space for safe access to the equipment under permit and for the work to be carried out.

- In the simple case, e.g., work on a circuit breaker in a switchyard, the marked boundary will coincide with the defined electrical isolation points, and this is the preferred marking.

- In more complex cases, the permit area will often not be the same as the area bounded by the equipment isolation points.

There may be several permit areas for a single permit, for example the opposite ends of an HV cable, each of these permit areas shall be controlled by the permit recipient.

Where sections of permanent fencing or walls can be used to define an area of work, and no access is possible, then the permit area boundary marking can be attached to the fencing or wall. The use of a fence or wall should be included in the permit area description when requesting the permit area.



Figure: 3 Example of permit area boundary marker

For permit areas on equipment that can be accessed from both the front and the back, such as indoor circuit breakers, a procedure shall be used to ensure both the front, and the back of the equipment is correctly identified and marked.

A permit area boundary may extend outside the physical boundary of the switchyard or station, providing the work is taking place at the switchyard or station e.g. a permit area boundary may extend around an item of mobile plant parked outside the switchyard or station boundary while it is working within the switchyard or station.

While marked at ground level, permit areas can include equipment above and below the ground or floor level and includes equipment both isolated and in service within the permit area.

A permit area shall not be sub-divided using permit area boundary marker.

3.2 Test Permits

Where a test permit is in force:

- the requirements of a permit area shall be applied, as above
- test permit warning signs shall be displayed within the marked boundary and any other warning signs removed (e.g. access permit)
- the entry point shall be closed, to stop entry to the permit area, while testing is undertaken.

3.3 Altering a Permit Area Boundary

Under agreement with the issuer, a permit area can be changed, or a portion of the permit area boundary marker may be temporarily removed to enable items of plant or materials to be moved into or out of the permit area.

All workers signed on to the permit must be informed of the change and the worksite safety plan should be reviewed.

The permit area boundary marker should be re-instated as soon as possible.

3.4 Storage of Boundary Marker

When permit area boundary marker is not in use, it must not be stored on any equipment to which a permit can be applied, in order to avoid any confusion regarding whether the equipment has a permit applied, magnetic strips shall be stored on a flat surface.

3.5 Permit Area Entry Points - Setup of Entry Point

Wherever possible a single point of entry should be formed, but in some cases, it may be necessary to form additional entry point(s).

- A point of entry should be only wide enough for personnel access (between 1 m and 1.5 m in width),
- There may be several permit areas for one permit,
- each permit area in a switchyard shall have a single point of entry, permit areas in stations may have more than one point of entry,
- All points of entry shall be controlled by the recipient,
- Signage including the permit details shall be displayed at each entry point.



Figure 4 Example of point of entry and Examples of permits

4. Permit Area-Setup and Signage at Specific Locations

4.1 Switchyards

Permit areas in switchyards

- shall be established to be as compact as practicable, while ensuring sufficient space for safe access to the equipment to be worked on and allowing for tools and equipment to be included in the permit area, e.g. mobile plant.
- shall have a single point of entry.
- shall be marked with continuous permit area boundary marker coloured yellow and green, e.g. rope, tape or chain, which shall be of non-conducting material.

The permit area boundary marker shall be supported at between 1 m and 1.5 m above ground or floor level and supports shall be spaced at intervals of approximately 3 m. Where a boundary of the permit area coincides with a switchyard fence, the fence may be used to mark the boundary.

Signs shall be placed inside the permit area boundary marker on separate stands or attached to the stands for the permit area boundary marker facing outwards to indicate that the permit area is the area inside the permit area boundary marker. The signs shall not be suspended from the permit area boundary marker.



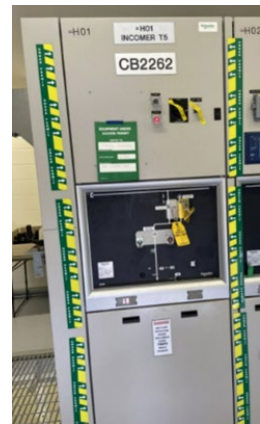
4.2 Indoor Switchgear

Indoor high voltage switchgear shall be marked when under an access or test permit, and low voltage switchgear should be marked as required by the asset owner or employer.

Magnetic or adhesive tape coloured with green and yellow stripes with “Under Permit” in white lettering and white arrows shall be used on the switchgear panels.

The magnetic / adhesive strips:

- are to be placed on the adjacent switchgear panels to ensure the correct switchgear is identified on both the front and rear panels.
- is to be placed vertically with arrows pointing towards the switchgear to which the access or test permit has been applied.
- should not be placed on any cover that can be removed, or on any door that can be opened, on the switchgear to which the permit is applied.



If the back of the switchgear is required to be accessed, it is important to ensure correct identification of the rear of the isolated switchgear, this can be achieved by placing an item on top of the isolated switchgear panel (if possible) to provide clarity when identifying the back of the switchgear.

If work is to be carried out on the top of the switchgear, magnetic / adhesive 'Under Permit' strips should also be placed on the top of the adjacent panels.

It is recommended that 'Under Permit' floor mounted notices also be used to give more indication of the equipment under permit.

When permit area boundary marker magnetic strip is not in use, it must not be stored on any equipment to which a permit can be applied, in order to avoid any confusion regarding whether the equipment has a permit applied. Magnetic strip must not be folded and is best stored flat or rolled.

4.3 Generating Stations

Permit area boundary marking shall be used in generating stations unless it is impracticable to do so, e.g. when the equipment covers several floors in the station. If it is impracticable to establish a permit area, other controls shall be used to ensure workers are not put at risk by the work being done under a permit.

The marking used in generating stations can be either:

- Continuous green and yellow rope or non-conductive chain, or
- Green and yellow stripped extendable barriers, or
- Adhesive or magnetic tape

Floor mounted 'Under Permit' signs should be used in generating stations on the routes persons may use to approach the equipment.

Permit areas in stations may have more than one point of entry, all points of entry shall be controlled by the recipient.



4.4 Wind Turbines

Wind turbines shall have the permit area defined and marked at the tower entry point.

5. Planning / Requesting a Permit Area

A request for a permit area requirement shall be made at the time of equipment release request for the permit and should clearly describe the equipment that is to be included in the permit area and how the permit area is to be set up, including the use of wall or fences where appropriate.

This will ensure that the appropriate preparations can be made to include the permit area setup is included as an issuer applied safety measure in the switching instructions for the permit.

It is important in the planning stage that both the issuer and the recipient of the access or test permit provide input to the permit area requirements. It is the recipient who requires the permit area to be defined for the safety of all those at the worksite, but it is the issuer who formally defines the permit area as one of the safety measures of the access or test permit.

A detailed layout of the permit area should be attached to the relevant access or test permit(s).

6. Permit Recipient Responsibilities

6.1 Control of Entry into a Permit Area

All workers working under the permit shall sign on to the access or test permit

No worker shall cross under or over the permit area continuous boundary marker.

All workers and persons who have been permitted to enter permit areas shall be required by the Recipient to leave the permit area before the permit is returned and instructed to keep clear of the area.

6.2 Persons Allowed Entry to Permit Areas

Persons who are allowed to enter permit areas include:

- (a) workers who have signed on to the access permit or test permit, including the Recipient
- (b) persons who may need to work on or inspect the equipment but who have not signed on to the access permit or test permit (e.g., representatives of equipment manufacturers and technical specialists), these persons shall be:
 - approved for entry by the recipient.
 - be under direct supervision while present in the permit area.
 - informed of the equipment covered by the access permit or test permit.
 - informed of the equipment, or part of the equipment they are allowed to inspect, or work on

- informed of any precautions they must take.
 - acknowledge that they understand and will comply with conditions of entry and sign an acknowledgement to that effect.
- (c) Workers carrying out operating duties, auditing, general inspection, etc, but not working on the equipment, these workers shall:
- where the recipient is present, act under the instructions of the recipient in matters of safety while inside the permit area, or
 - where the recipient is not present, they shall familiarise themselves with current the state of equipment, this could be done by contacting the recipient or the issuer. They shall be entirely responsible for their own safety.

6.3 Mobile Plant within Permit Areas

Normally any mobile plant shall be included within the permit area.

When mobile plant or other large items are to be brought in or out of a permit area, the recipient, in agreement with the issuer, can temporarily remove a portion of the boundary marker to allow such movement, and then immediately reinstate the marker.

Where mobile plant is not able to be included in the permit area it shall be as close to the area as possible, and where appropriate the road controlling authority rules must be applied. Specific hazard/risk assessment must also take place, including preventing public access to the mobile plant.

Mobile plant shall be bonded to the switchyard earth mat.

The EEA Guide for '*The Use of Mobile for the Electricity Supply Industry*' cover the requirements for mobile plant.

7. Marking of Work Area Limits for Items of Equipment not Subject to the Permit

When work is to be carried out on equipment where there is live HV equipment in the vicinity of that equipment, or a live HV conductor within the equipment to be worked on, the following procedures shall be followed.

7.1 Establishing Work Zone Limits

Within a permit area, immediate work zone limits shall be identified at the work position which establishes the limits for workers, and any item in contact with the worker. The process of determining the work zone limits shall consider where any live conductors are sited within the vicinity of the work zone, and whether it is possible to gain inadvertent access to those conductors, e.g. by removal of a cover, opening of a door, climbing etc.

At selected positions on the identified work zone limits, a red marker shall be placed as a

visual reminder that the employee, or anything in contact with them, cannot move beyond that marker.

The work zone shall be limited to the zone within which the work can safely and practically take place, i.e. the limits are those which are necessary for the work. Lack of a marker does not indicate that the equipment is safe beyond that point.

The work zone limits shall be three-dimensional as necessary.

Notes:

- A permit area may contain one or several work zones.
- The permit area boundary marker may form part of the work zone limits

7.2 Work Zone Limit Markers

Work zone limit markers shall be non-conductive, have a predominant colour of red, and may be flags, magnetic strips, tape, fencing/netting, cones etc.

Markers shall be placed only on:

- equipment supporting structures which are earthed,
- de-energised equipment or conductors,
- non-conducting supports such as cones,
- upper reaches of ladders or other similar equipment used to gain access to elevated equipment.

Markers shall be a minimum of 1m from any exposed live conductor, and, where practicable, outside the MAD. If it is necessary to encroach the MAD to place a marker, the equipment shall be de-energised, or an operating stick that meets the requirements of the Technical Guide for Portable Equipment for Work On Or Near Conductors shall be used.

7.3 Information Markers

Markers indicating energised conductors overhead may be placed at appropriate positions to further identify energised overhead hazards. Such markers are for information and must be placed within the work zone limits.

An information marker is to be of yellow background with black lettering.

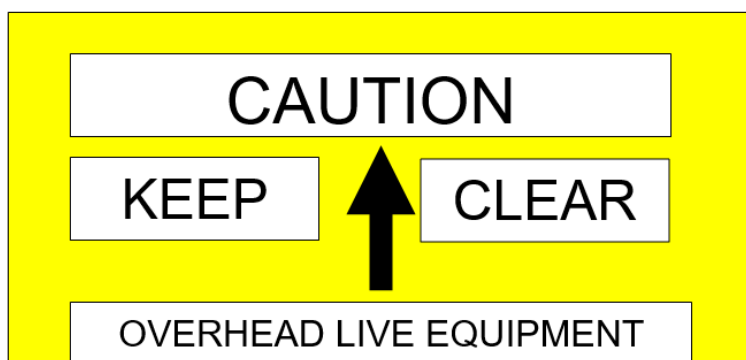


Figure: 5 information marker

7.4 Marking of Access Routes to Elevated Equipment in a Switchyard

Where an access or test permit is applied to elevated equipment in a switchyard, and it is necessary to use a means of access to the equipment which allows choices to be made about the route to follow, the planned route shall be delineated by markers prior to routine access taking place. This is to ensure that workers are able to move safely around the marked area without encroaching on the MAD of live equipment.

7.5 Marking System

The marking system to be used for access routes to elevated equipment is green high visibility flags with clip-on pegs to indicate a 'go' area and red high visibility flags with clip-on pegs to indicate a 'no go' area, all of which shall be non-conductive.

The green flags are placed to indicate to a worker that the route on which the flag is placed is a 'go' area. Flags shall be placed at approximately 5m intervals along the safe access route(s).

The red flags are placed to indicate to a person that the route on which the flag is placed is a 'no-go' area.

Flags shall be placed:

- at all points where a person could make a decision about which route to follow,
- as necessary to indicate to a person that should they stand up there is a hazard above them,
- at all points along the route where access to in-service equipment is possible, e.g. strung bus hardware and insulators.

Before any marking in elevated equipment occurs:

- the permit area shall have been marked out
- an access or test permit shall have been issued for the equipment to be worked on,
- a safety observer shall be appointed, and
- the safety observer and competent person who will place the marking shall have signed on to the permit.

The recipient, safety observer and the competent person who will place the marking shall plan the access route from ground level. All points at which markers are to be placed shall be identified. Any point at which the MAD may be encroached shall be specifically identified. If placing the markers requires the worker to encroach the MAD the work must not proceed and the affected equipment removed from service, or an operating stick that meets the requirements of the Technical Guide for Portable Equipment for Work On, Or Near Conductors shall be used.

Markers shall be placed only on de-energised equipment or conductors, and shall be a minimum of 1m from any exposed live conductor, and, where practicable outside the MAD.

An access route to elevated equipment shall be via a structure or part of a structure which is at earth potential, or via an MEWP.

Under the guidance of the safety observer, the competent person is to climb the structure by the pre-planned route, using fall-arrest attachment as required. At the pre-planned points markers are to be placed.

On completion of the work and before the access permit is returned, the recipient, safety observer and the competent person who will remove the marking shall discuss the access route to be used from ground level to confirm that the previously used route is safe, or that changes to it are required.

Under the guidance of the safety observer, the competent person is to climb the structure by the pre-planned route, using fall-arrest attachment as required, and remove the markers.