Protection against accidental contacts with normal conducting magnets

Consolidation program

NA / EA / AD experimental areas

Olivier Crettiez
on behalf of TE-MSC-MNC
Overview of present situation
Recall

1. TE Department has undertaken a full inventory of its equipment, with regard to electrical hazards for electrical and non-electrical works in its vicinity.

2. A review of the situation of the active parts of all the normal conducting magnets in the CERN accelerator complex with respect to accidental contacts was completed early 2019, [https://edms.cern.ch/file/2068726/0.1/Internal_Note_2019-02.docx](https://edms.cern.ch/file/2068726/0.1/Internal_Note_2019-02.docx)

6. Level of protection provided by the covers

We define five levels graded from a to e, from the highest protection to the lowest protection.

- Level a: Full protection
- Level b: High protection
- Level c: Medium protection
- Level d: Low protection
- Level e: None — No protection

Protection against accidental contacts with normal conducting magnets
Consolidation program

Mandate

1. A progressive consolidation program upgrading the present protections to conformity was established and is engaged during LS2 with the objective of being completed by December 2020.

2. Priority is given to eliminate level category “e” magnets with best effort also on level category “d”.

3. Work is coordinated by TE/MSC, in close collaboration with EN-MME and HSE from problematic on site to production to study to design to archive to installation to conformity during LS2 by the end of 2020.

Olivier Crettiez

Protection against accidental contacts with normal conducting magnets
Consolidation program
Where?

1. All actions on level category “e” magnets within 2020
2. Best effort on level category “d” magnets within 2020
3. Implementation on level category “d” magnets in a second phase, not during LS2
4. Presentation focused on NA / EA / AD

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area
- North Area
- TT2

Actions on category “d” magnets not within 2020
- SPS, LHC
- TT10, TT40, TI2, TI8

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Protection against accidental contacts with normal conducting magnets
Consolidation program

How?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD
- SPS
- TT40
- T18
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area
- North Area
- TT2

Example of conform protection cover
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

**North Area**
Consolidation April 2020
Estimated duration 1 day

Actions on category “e” magnets within 2020
• PS Booster
• PS ring
• AD
• SPS
• TT40
• T18
• T12

Actions on category “d” magnets within 2020
• Linac4
• PS Booster
• PS ring
• East Area
• North Area, April 2020
• TT2

How and When?
2 magnets, 2 families

New protective covers

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Protection against accidental contacts with normal conducting magnets
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level

East Area
Consolidation March 2020
Estimated duration 1 week

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD
- SPS
- TT40
- T18
- T12

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area, March 2020
- North Area, April 2020
- TT2

5 QDS - PXMQNDCCTWP
9 QFS - PXMQNEGWTWP
4 QFL - PXMQNEFTWP

18 magnets, 3 families
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

**AD ring and experimental areas**
Consolidation November 2020
Estimated duration 4 weeks

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD, November 2020
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area, March 2020
- North Area, April 2020
- TT2

**113 magnets, 18 families**
Protection against accidental contacts with normal conducting magnets

External structure
No conflicts with other elements of the machine

Integration in AD Layout
From present situation
to new covers

ECR was issued and will circulate for approval

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Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

AD ring and experimental areas
Consolidation November 2020
Estimated duration 4 weeks

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD, November 2020
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area, March 2020
- North Area, April 2020
- TT2

How and When?
113 magnets, 18 families
April 2020
AD ring and experimental areas
Consolidation November 2020
Estimated duration 4 weeks

External structure
No conflicts with other elements of the machine
Integration in AD Layout
From present situation
to new covers

113 magnets, 18 families
Protection against accidental contacts with normal conducting magnets

ECR was issued and will circulate for approval
Consolidation program
Calendar

Compatibility shall be studied with the machine responsible and confirmed by the Facility Coordinator or BE-OP

<table>
<thead>
<tr>
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<th>Estimated duration</th>
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<tbody>
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<td>/</td>
</tr>
<tr>
<td>TI8</td>
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<tr>
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<tr>
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<td>2 weeks</td>
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<td>SPS</td>
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<td>1 day</td>
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Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD, November 2020
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
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Consolidation program
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### Consolidation program

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BE-OP proposal

W30 - Period 8 to 15
W31 - Period 16 to 7

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Protection against accidental contacts with normal conducting magnets
Consolidation program Monitoring

1. The studies and drawings are available and archived through CDD
2. All the magnets categories “e” and “d” part of the consolidation program and equipped with new protective covers are and will be inspected in the machines by HSE
3. The certification reports w.r.t. IP standards delivered by HSE are and will be registered and linked to the magnet documentation in Norma database
4. A dashboard to follow the progress of the consolidation program is accessible via the main site on TE electrical safety of accelerator equipment