FIRE INVESTIGATION

IDENTIFYING FIRE CAUSED BY ELECTRICAL ENERGY

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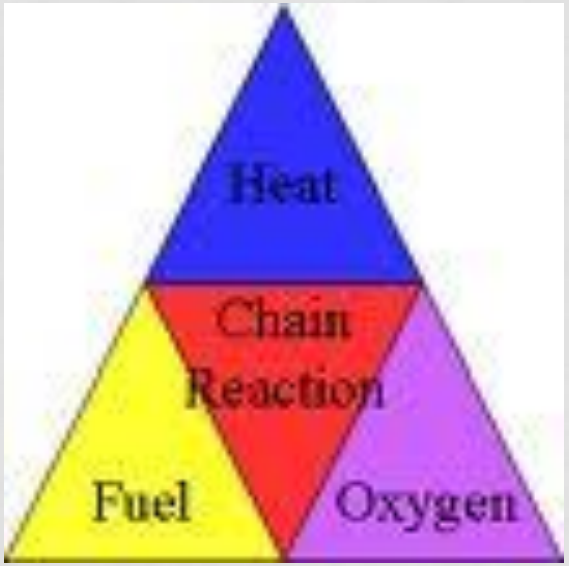
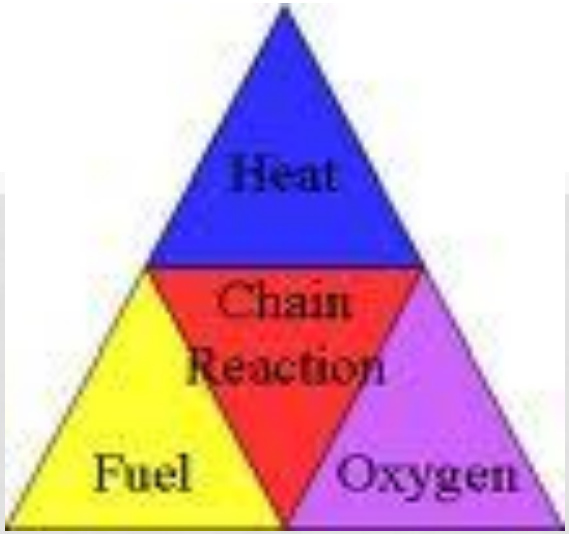
REVISION: WHAT IS FIRE?

- Fire Triangle

- Fire Tetrahedron





-Element related to electrical fire is: _____ ?

-WHY?

ELECTRICAL PRINCIPLE IN RELATION TO FIRE:

1) **Electric conductor / semi-conductor**
   - metal
   - carbon
   - moisture

2) Heat creation

- any conductors / semi-conductors that allow electric flow (current) will produce some heat.

  - Why?

  - Electric current (moving electrons) create friction (resistance) in the conductor.

3) Heat intensity depends on:

i) Power consumption

- Use more power – more heat
- Use less power – less heat

3) Heat intensity depends on:

ii) Material of the conductor

- iron; aluminum; copper; brass, zinc…

(Different material have different conductivity, conductivity will depends on resistancy)

- Material create less resistant – good conductor; produce less heat.
- Material create more resistant – poor conductor; produce more heat.

(conductor c/w semi-conductor)

3) Heat intensity depends on:

iii) Size of conductor

Same material but different size:

- Big size – create less resistant; produce less heat.
- Small size – create more resistant; produce more heat.

3) Heat intensity depends on:

iv) Heat dissipation

Natural / mechanical ventilation:

- Effective heat dissipation – less heat will remain.
- Ineffective heat dissipation – more heat will remain.

IDENTIFY FIRE CAUSED BY ELECTRICAL ENERGY

1) Identify area of origin
2) Witness testimonies
3) Inspect main electrical panel and determine "Electrical Time Line"
4) Identify potential sources of ignition
5) Identify damages on electrical appliances - pre / post fire

(1) IDENTIFY AREA OF ORIGIN

- ***Area Of Origin*** - Area / place where the fire began (wider area).
- C/W ***Point Of Origin*** - exact physical location where heat source and fuel came in contact and started a fire.
- Determine by looking at **fire patterns** and **fire effects** of fire.

(2) WITNESS TESTIMONIES

a) Occupant – on scene / not on scene
b) Owner
c) 3rd Party / by-stander
d) Fire Officers

(3) INSPECT MAIN ELECTRICAL PANEL AND DETERMINE ELECTRICAL TIME LINE

- Inspect the electrical distribution panel for any sign of tripping in MCB, ELCB and main fuse.
- Significant of this is crucial in creating a hypothesis in an early stage and supporting any evidence found latter. HOW???
- Need to check whether the electrical panel had being 'disturbed' by the occupant or fire officers during fire fighting operation.

Electrical Time Line

- Time Line - graphic representation of the events occurrence in chronological order.

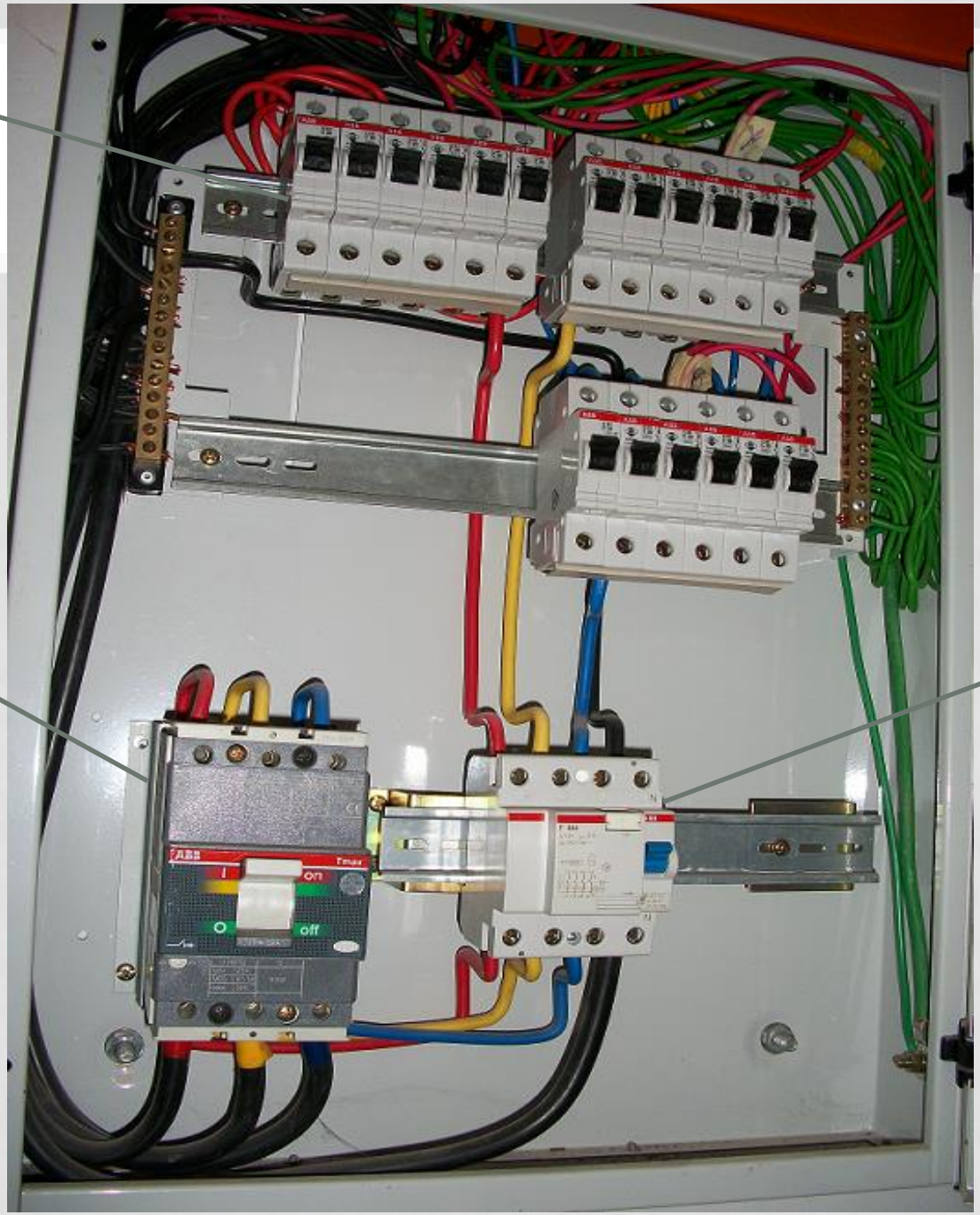
  - provide guidance as to what had occurred 1st in the electrical system and its subsequent events. (by checking on the Main Fuse, ELCB and MCB)

  - used to support any subsequent physical finding on the area / point of origin.

  - narrow / focus down the area to be searched.

MCB

Main Switch



ELCB

Basic Guideline: Electrical Time Line

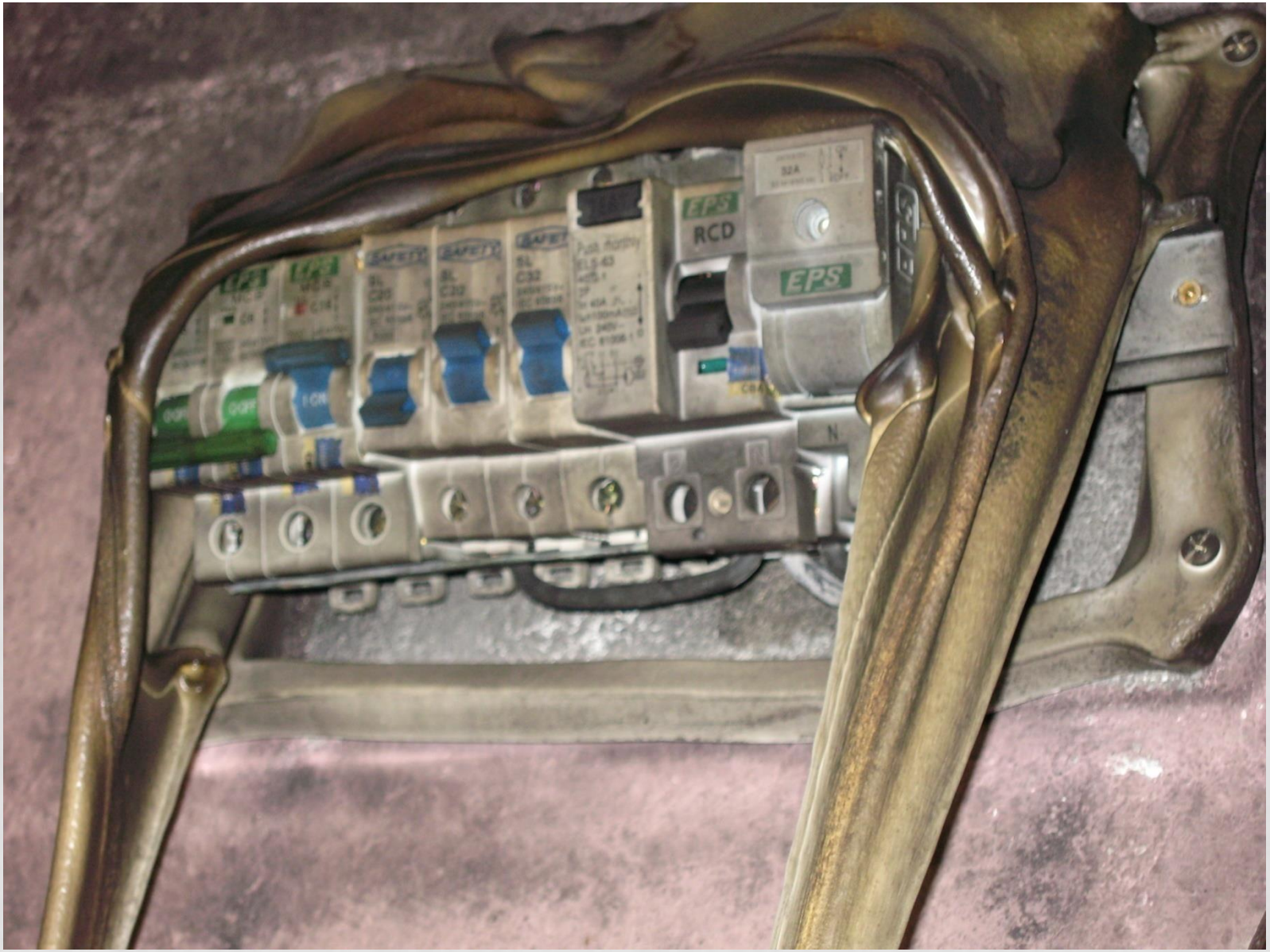
i. MCB(s) tripping will indicate the particular tripped electric branch.

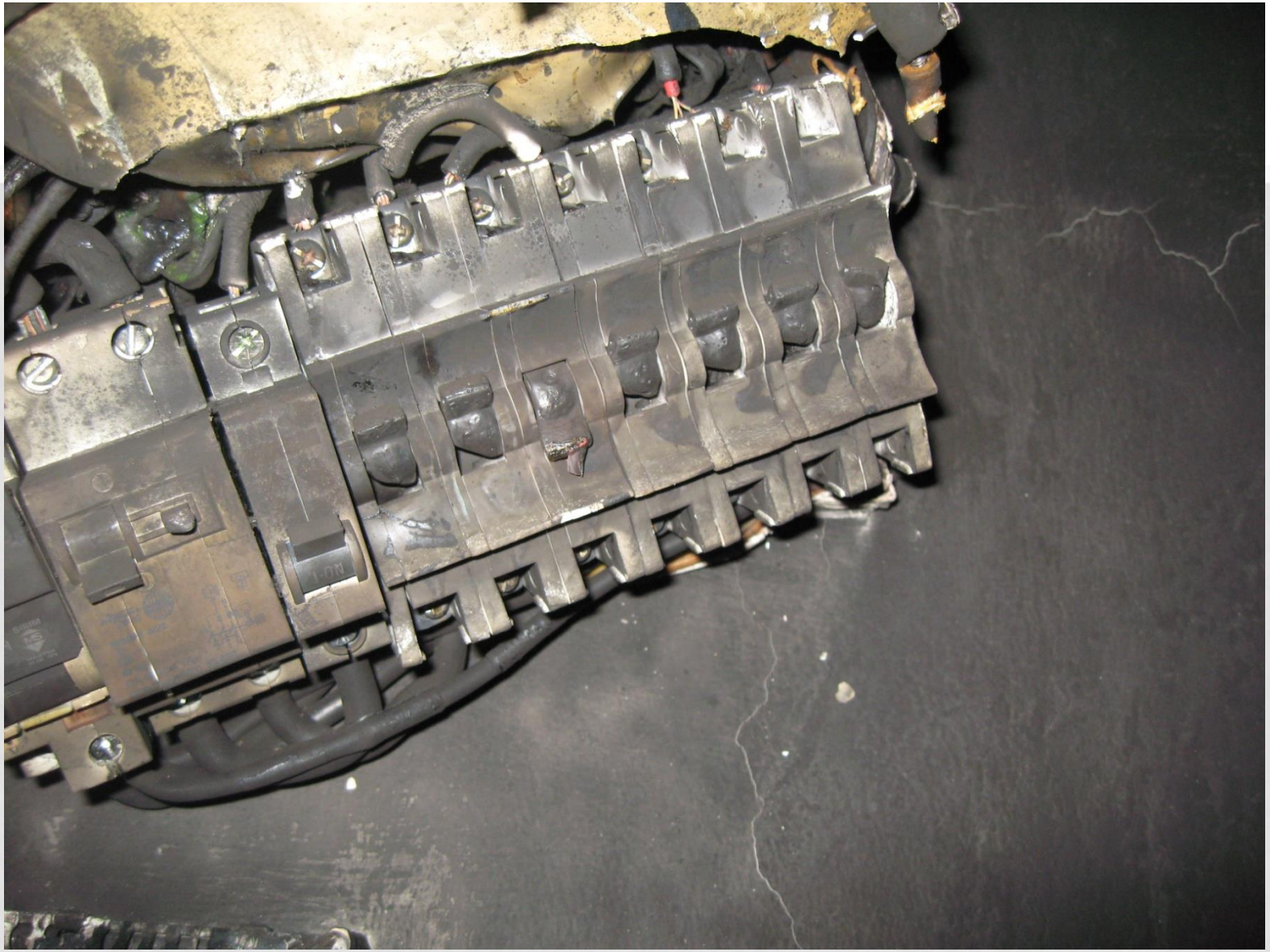
ii. Both MCB(s) and ELCB tripped – MCB(s) must have tripped 1st before ELCB.

iii. Only ELCB tripped – no MCB tripping is possible because no more power supply.

- Finding of any physical evidence of electric caused "activities" in certain area will indicate that as potential area / point of origin, regardless the fire was electrical related or not.


multi 9
C32
C32
ON
OFF
OFF


EPS
RCD
EPS
N



(4) IDENTIFY POTENTIAL SOURCES OF IGNITION

a) Area of Origin
b) Point of Origin

- Electrical appliances
- Non-electrical sources of ignition

(5) IDENTIFY DAMAGE ON ELECTRICAL APPLIANCES

- Melting point of different metals plays an important part, example:
  - Iron – 1540 ^{0}C
  - Copper – 1082 ^{0}C
  - Aluminum – 660 ^{0}C
  - Tin – 232 ^{0}C

  - Alloy metal (mixture of metals) – will have lower melting point than its pure metal.

ANALISA SAMPEL BAHAN BUKTI

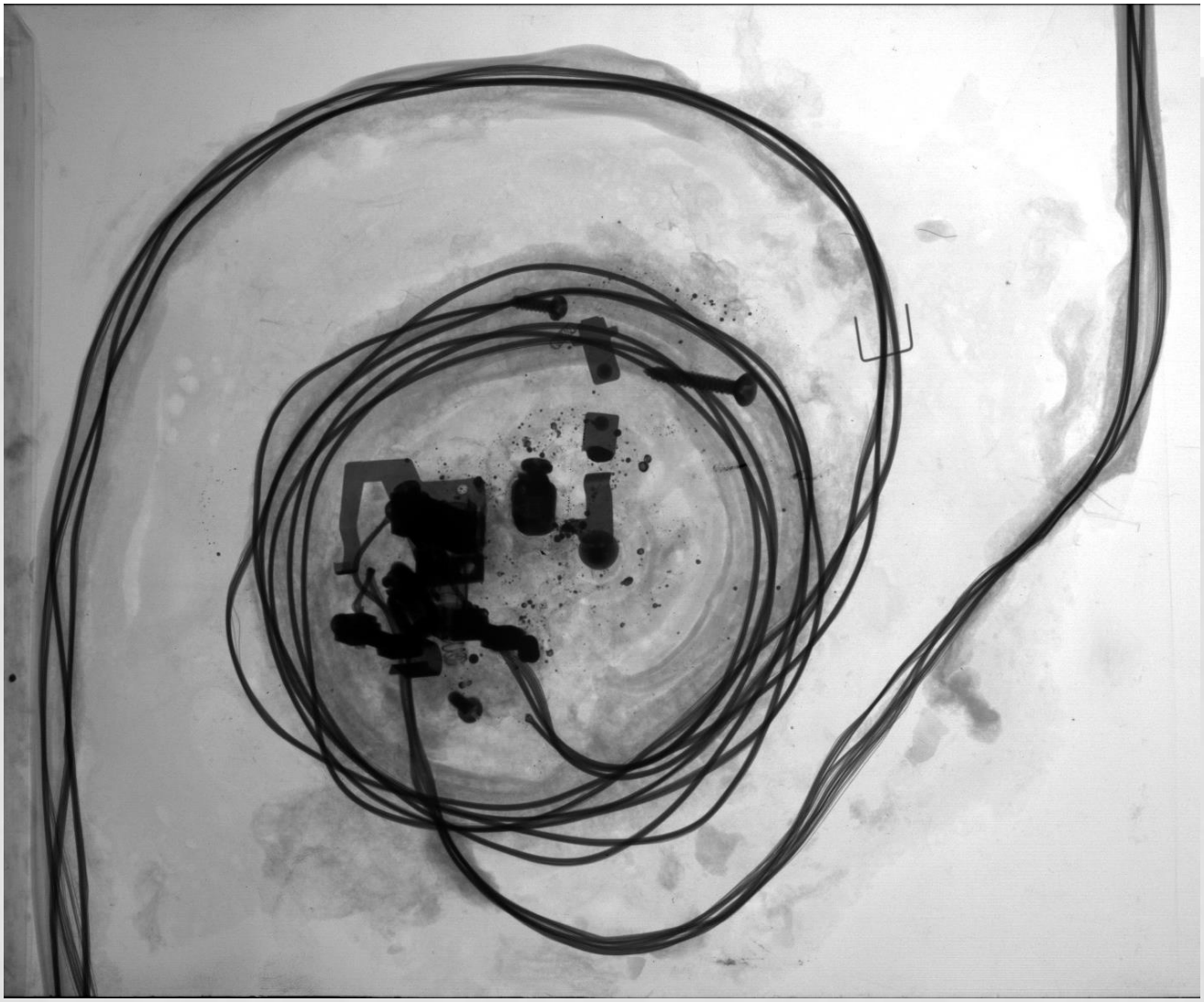
- Round Extension Socket

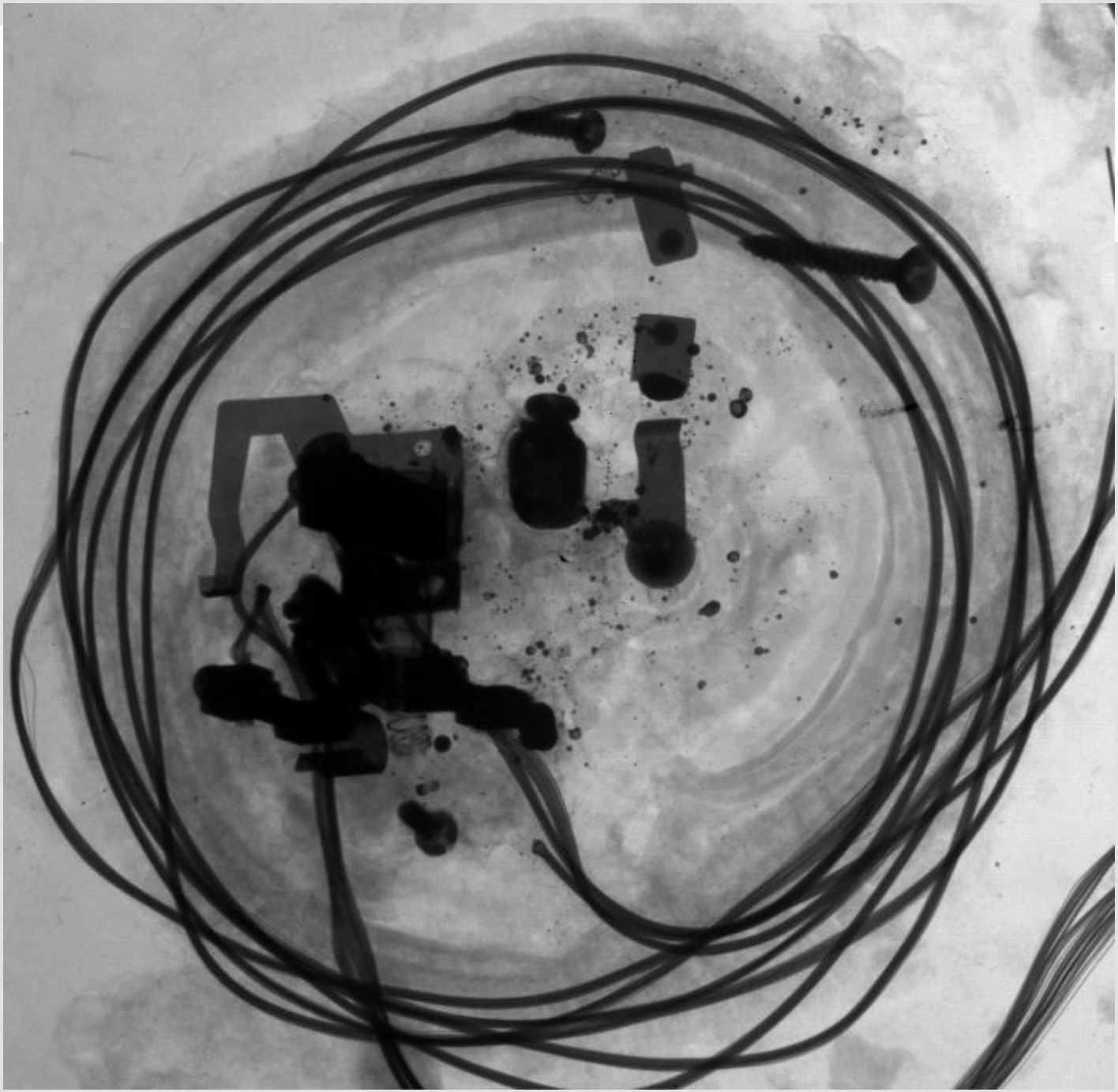
Contoh sampel bahan bukti

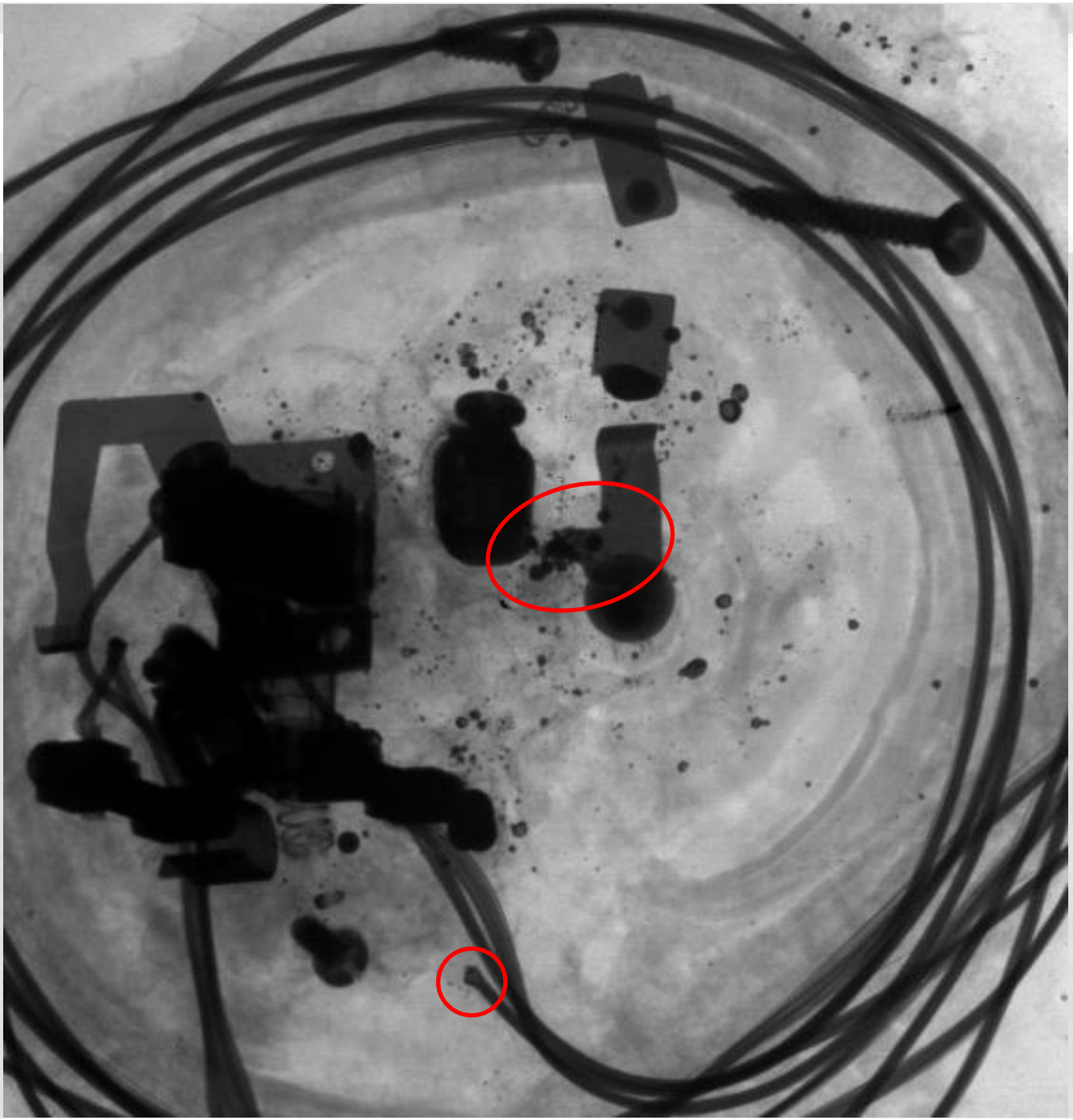
Sampel Round Extension Socket

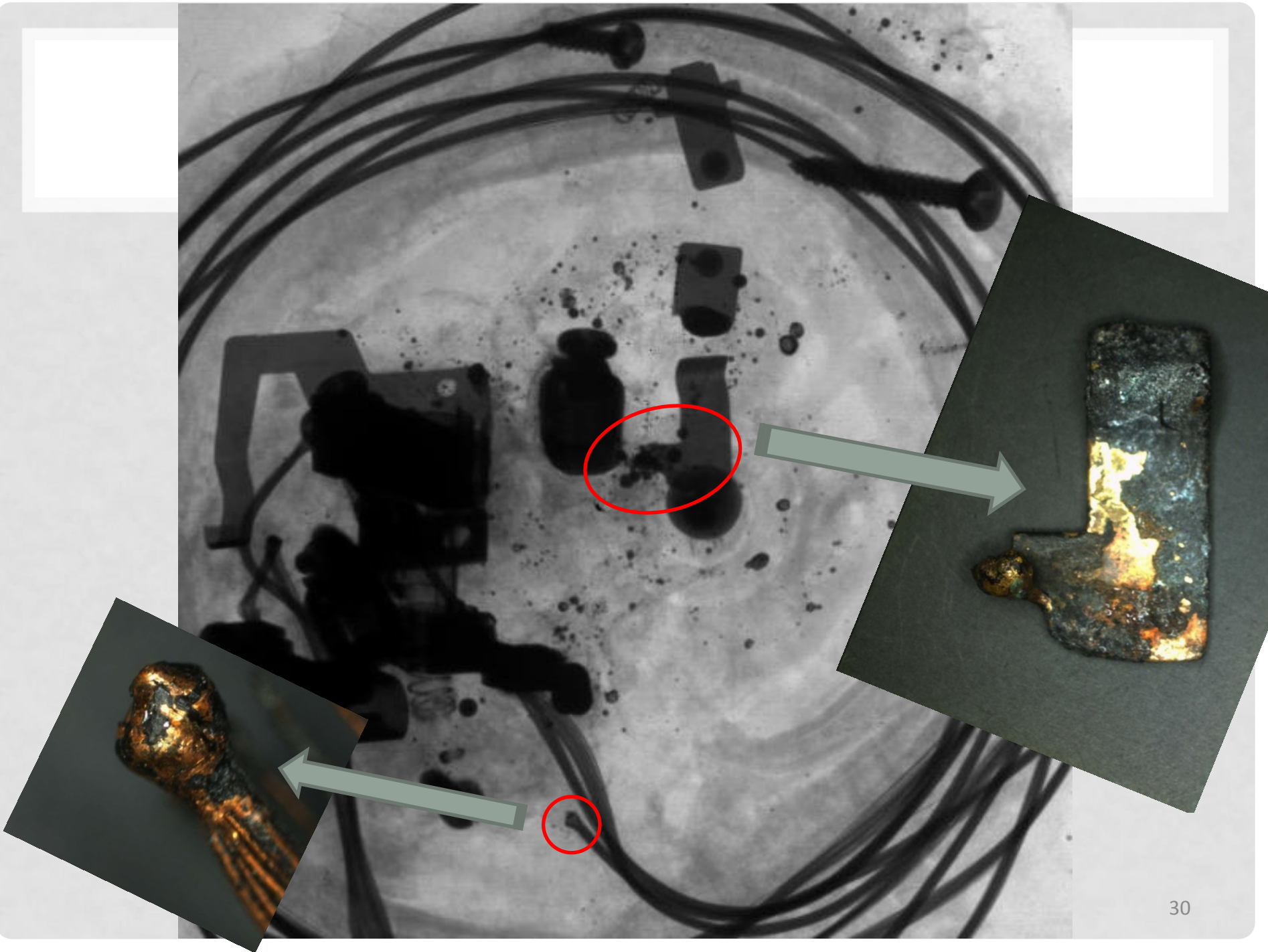
Pencerapan imej X-Ray pada sampel

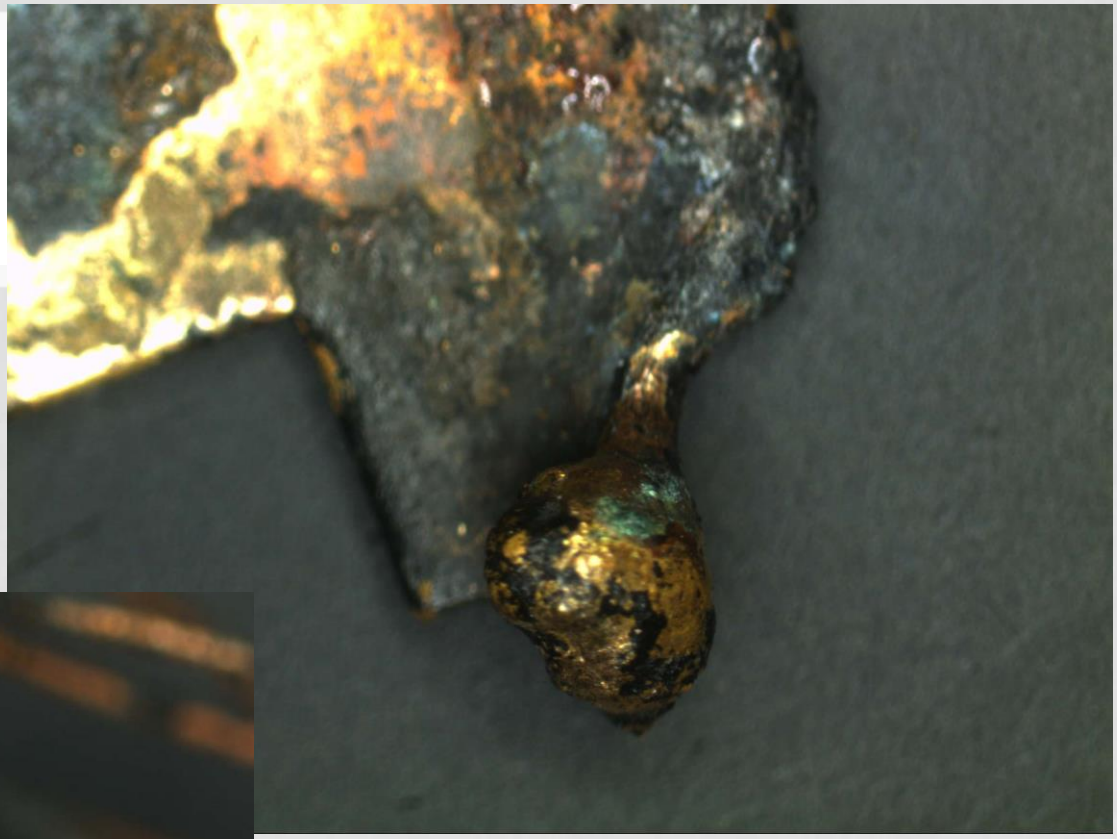
IMEJ X-RAY: ROUND EXTENSION SOCKET











ANALISA SAMPEL BAHAN BUKTI

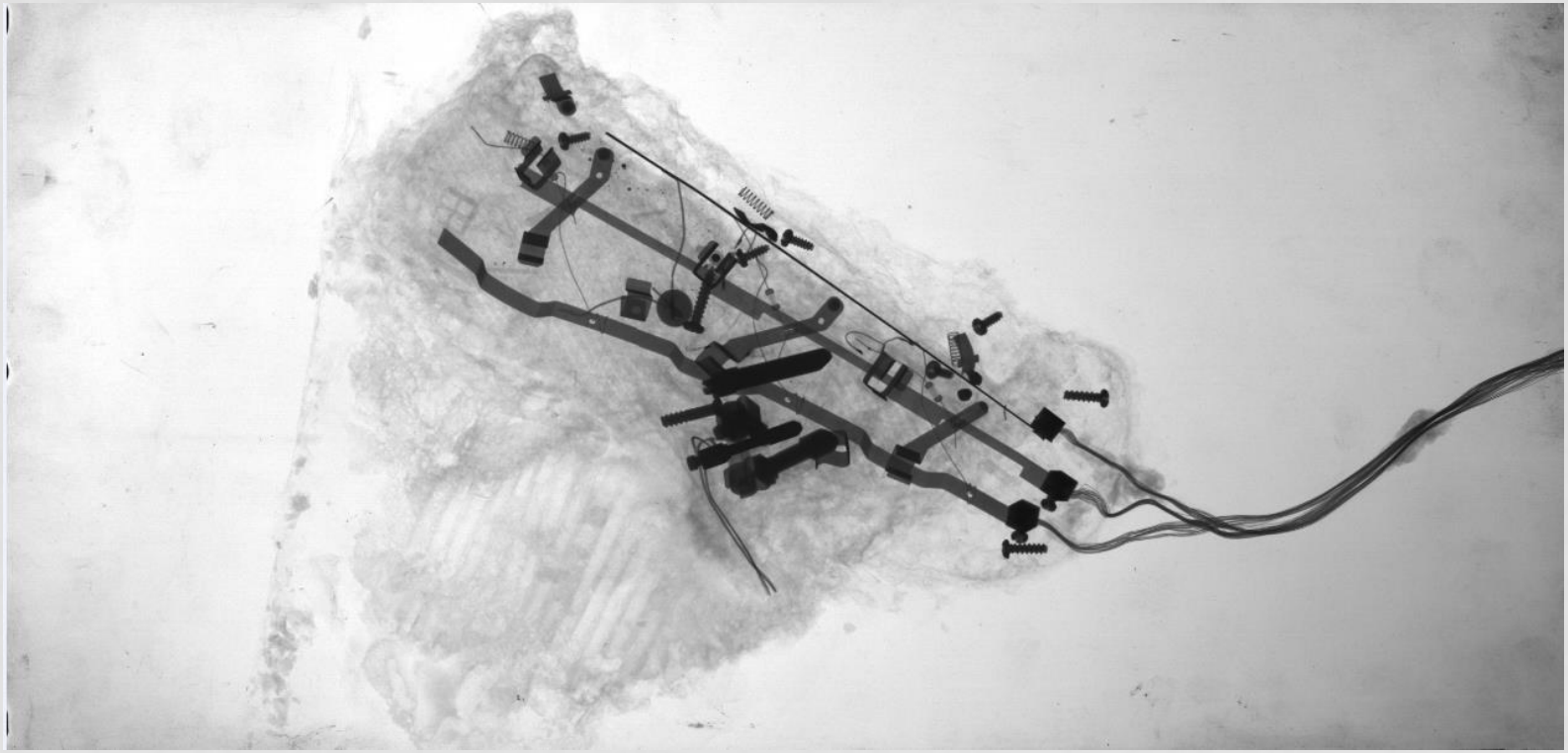
- Extension Socket

Contoh sampel bahan bukti

Sampel Extension Socket

Pencerapan imej X-Ray pada sampel

IMEJ X-RAY: EXTENSION SOCKET



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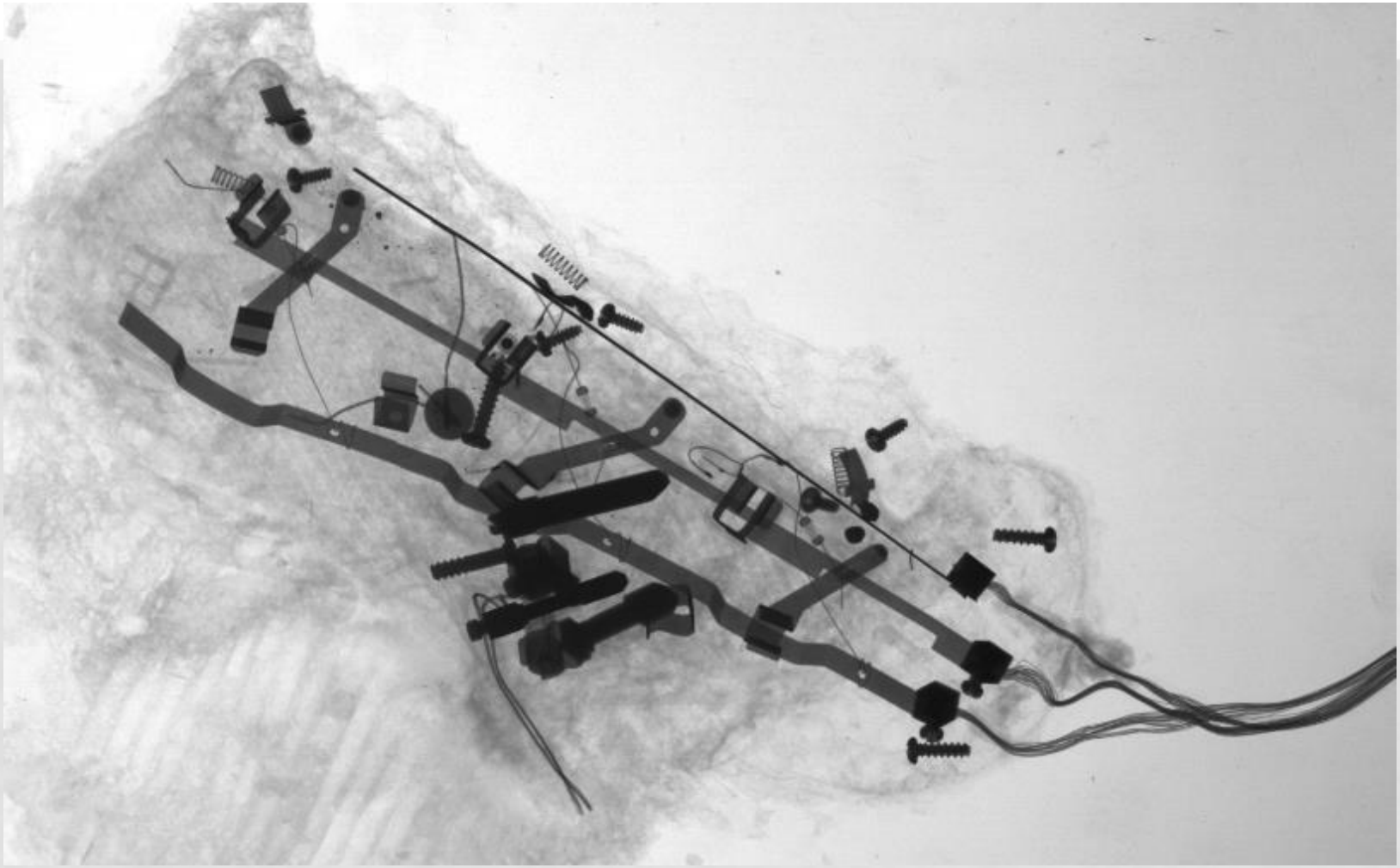

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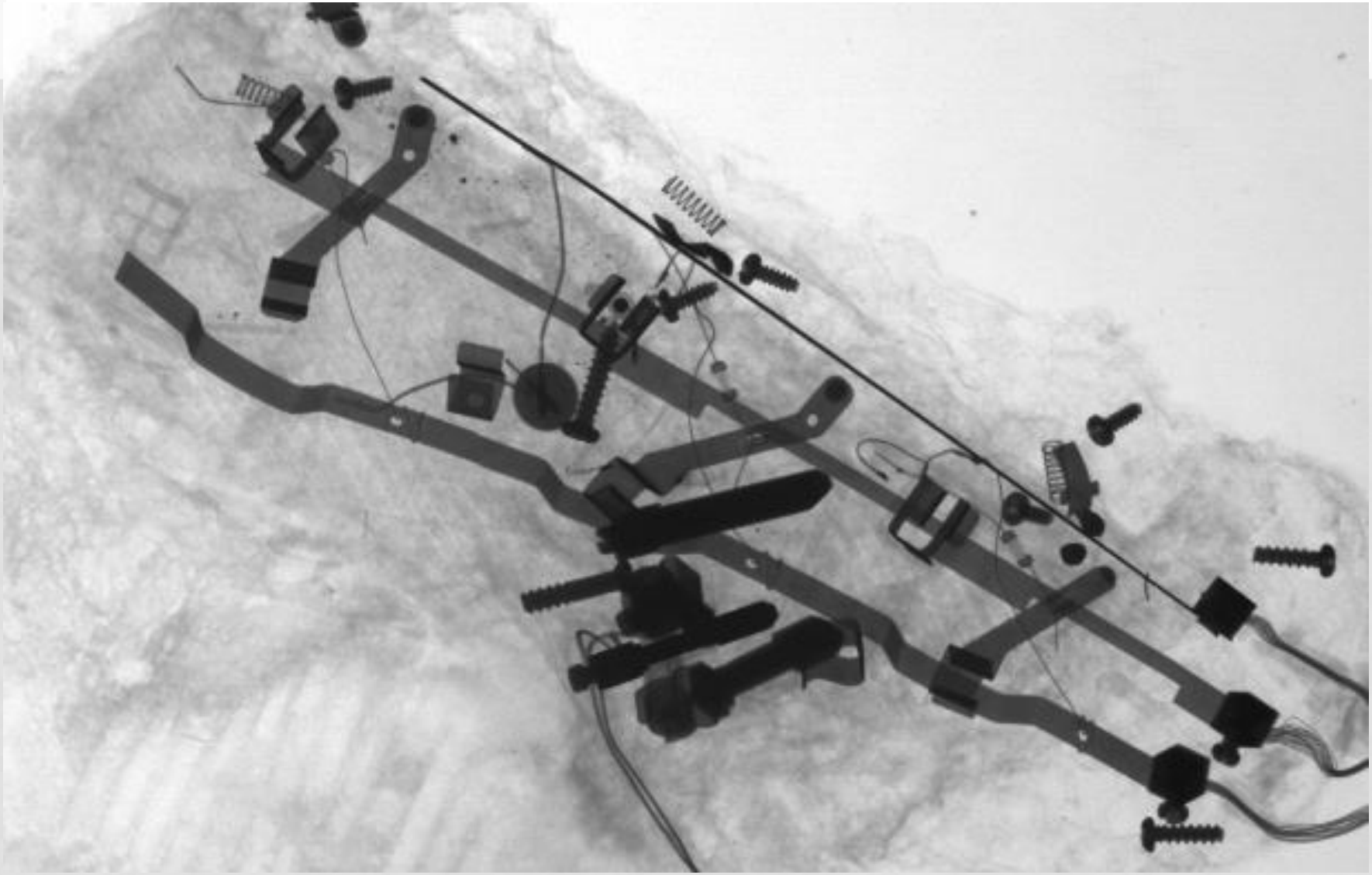

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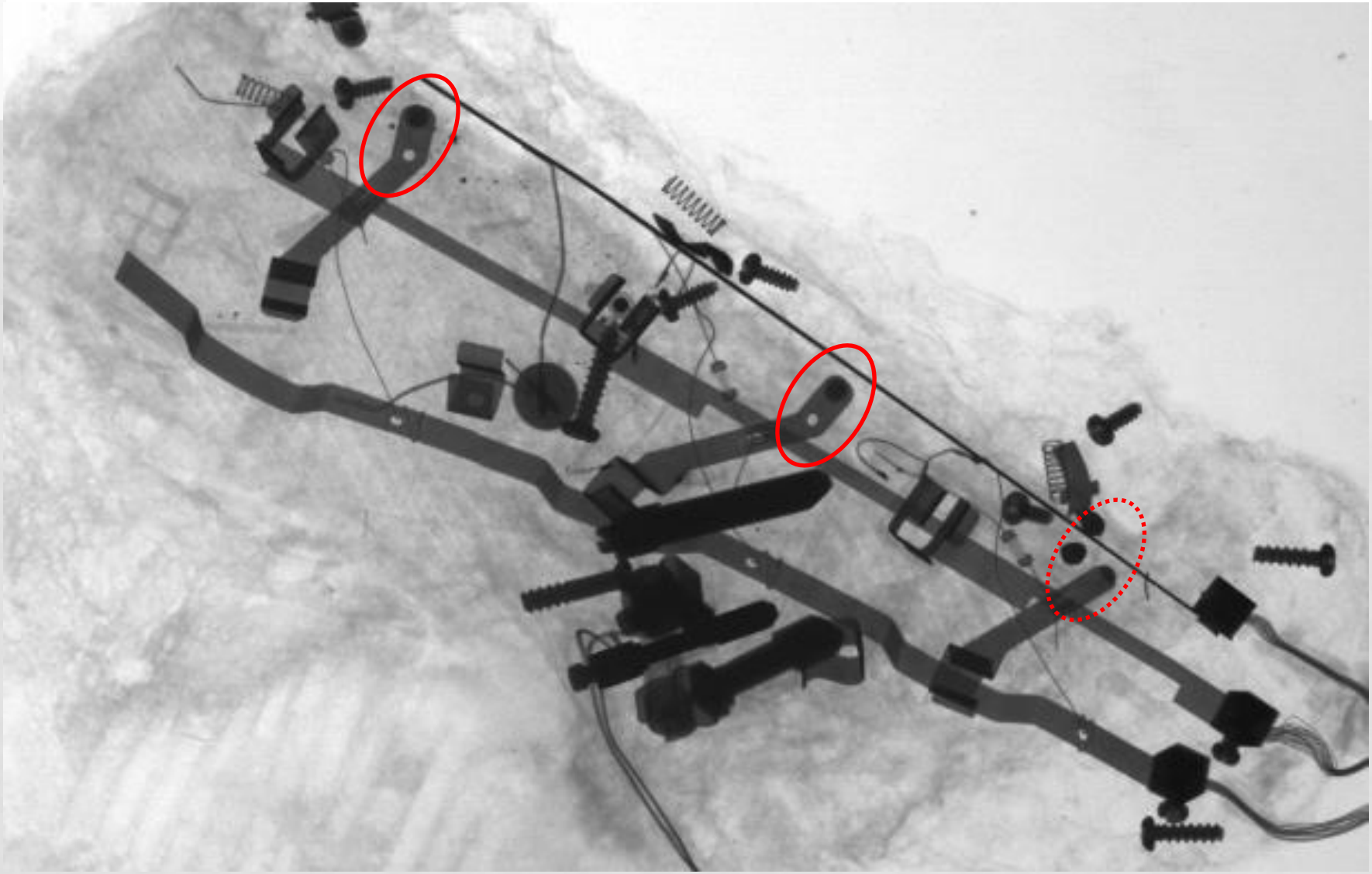
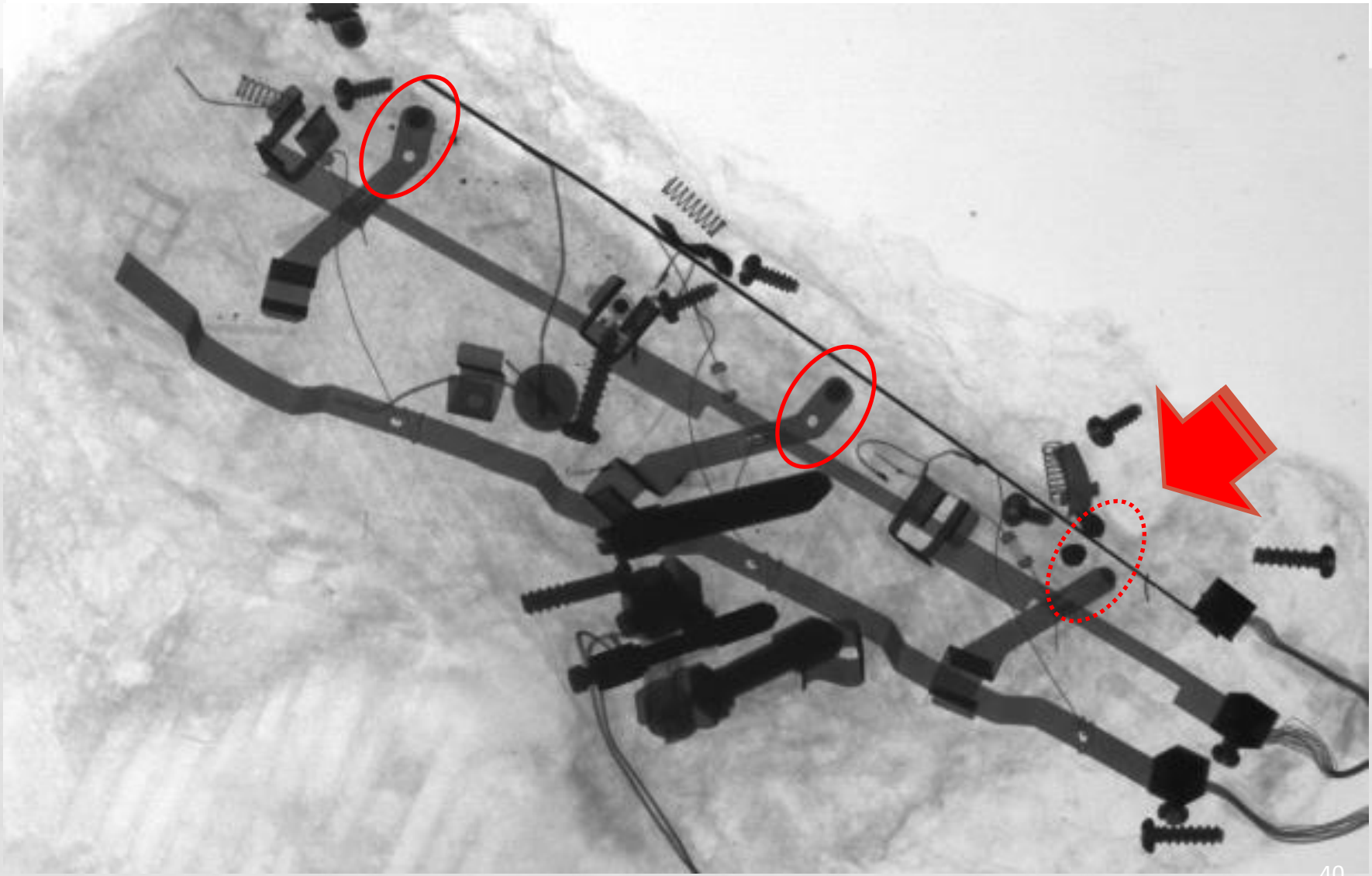
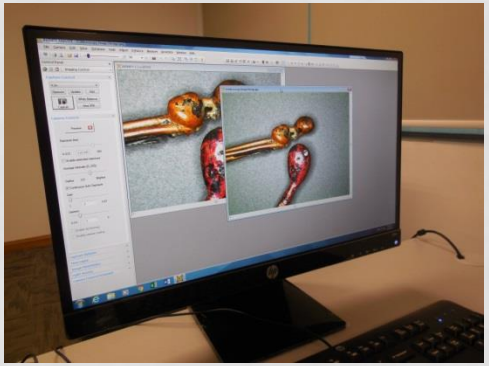
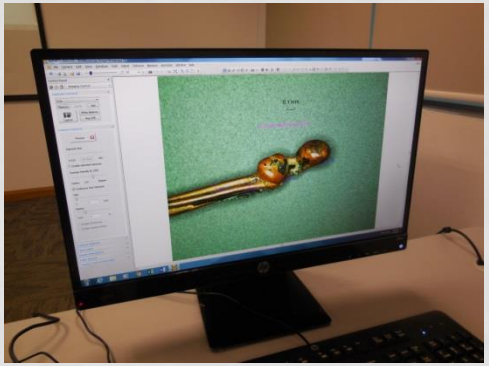
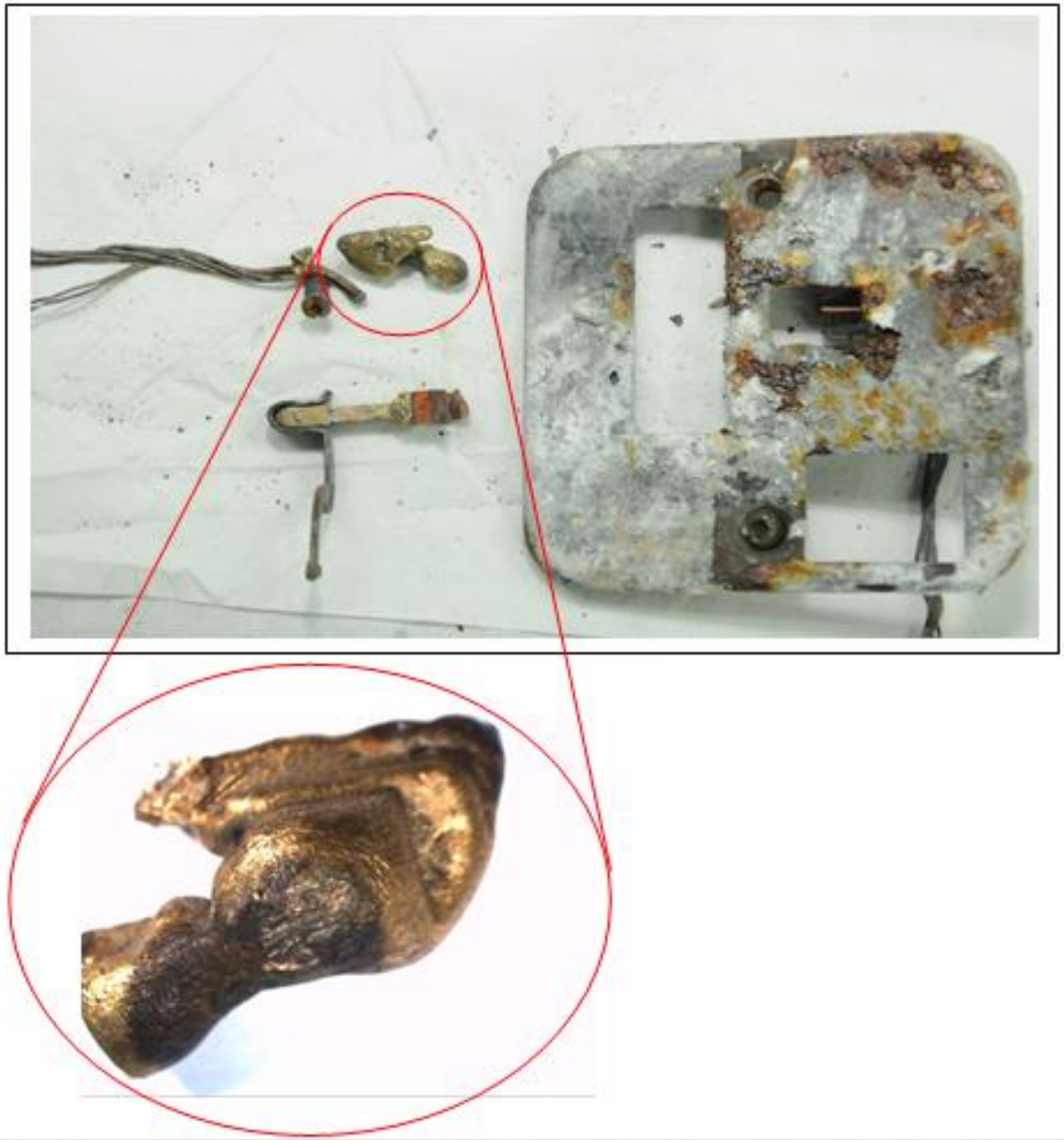


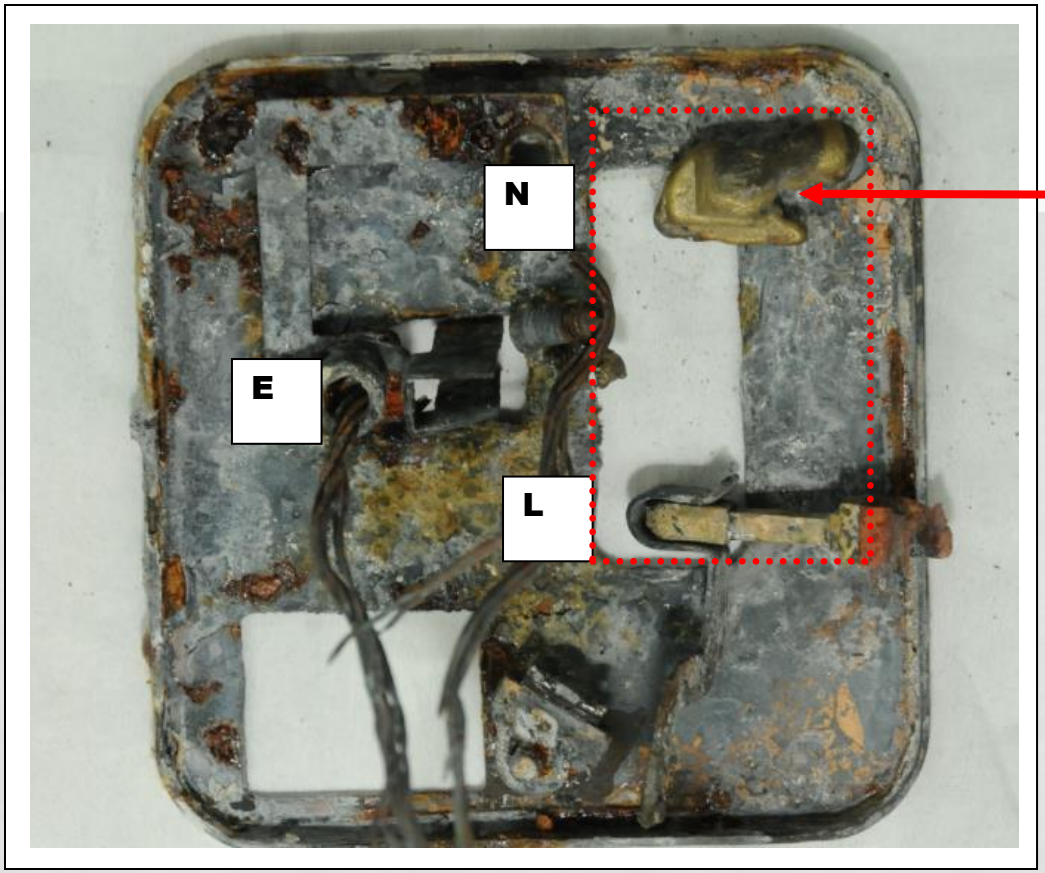


MICROSCOPE TELESKOPIC



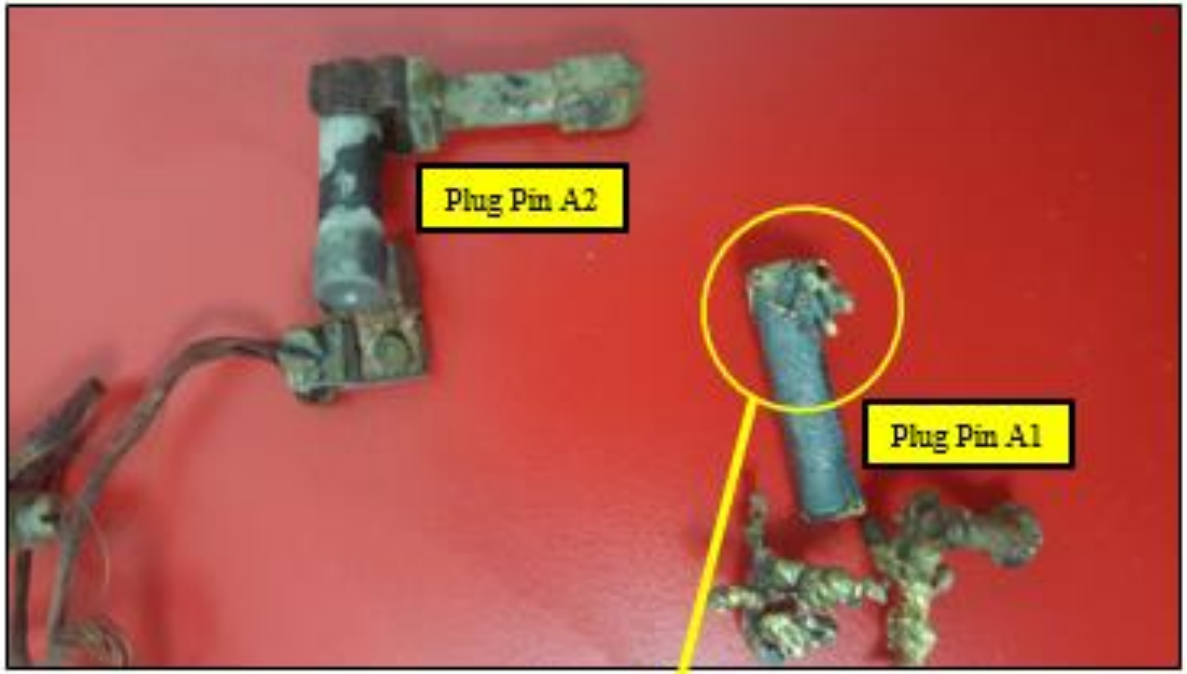


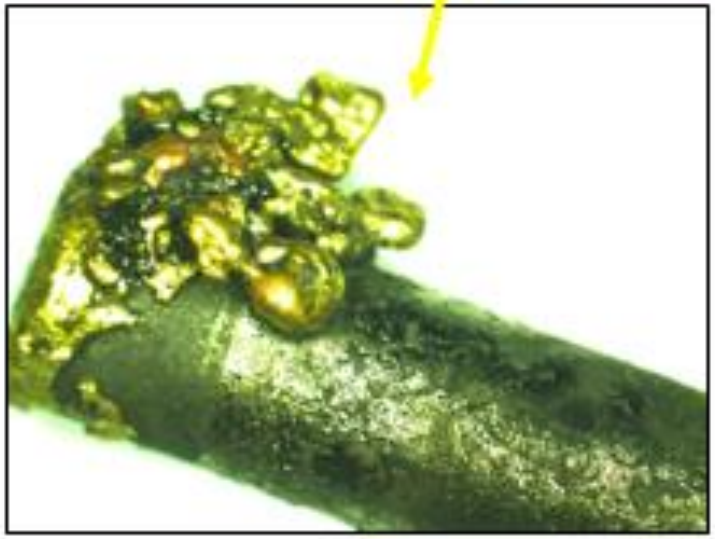




Plug pin yang mengalami kesan *melting*

PLUG PIN* MENGALAMI KESAN *MELTING* DAN MELEKAT BERSAMA *PLUG POINT* YANG DIJUMPAI DI TEMPAT KEBAKARAN DISEBABKAN OLEH *POOR CONNECTION.



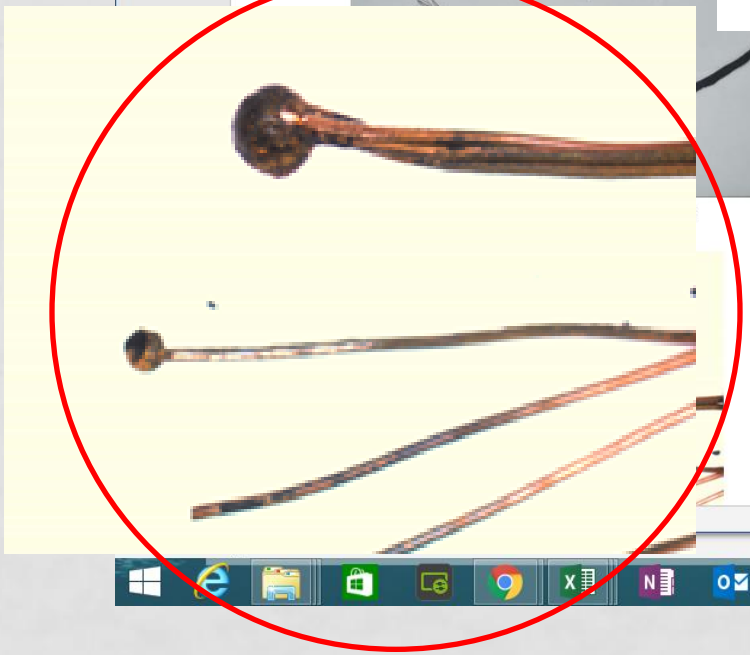


Gambar 13: Keadaan plug pin A1 yang *melting*.

Gambar 10(a): Kedudukan wayar bertanda C1

terminal bateri.

Gambar 11(a): Kedudukan connector wayar bertanda C2



- Temperature reachable in a normal fire (800 ^{0}C – 1040 ^{0}C) depends on:

a) fuel load
&
b) ventilation

QUESTION …

Q: If we found the arcing mark on electrical wiring or appliances, can we conclude that the fire was caused by electrical in that area?

WHY?

ANSWER …

A: No. We still need to consider all the evidence available before coming to final conclusion. Scientific method need to be followed.

SIGNIFICANT OF ARCING MARK…

However, arching mark is important in showing:

i. At the time of fire, the area of arcing mark have electric supply.
ii. The fire most probably started near that area (area of origin).

Thank You…