Classified Facility Communications Cabling
Infrastructure Design Basics

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What is a Classified Network?

- United States (US) Government defines and assigns one of 3 levels of secrecy:
  - **Top Secret** — Highest Level
  - **Secret** — 2nd Highest Level
  - **Confidential** - Lowest Level
Classified Info – Keeping it Secret!

- Federal and military facilities require safeguarding Classified electronic information and infrastructure.
  - Eliminating emanation of signals associated with structured communications cabling systems.
  - Countermeasures designed to reduce the risk of exploitation of information by adversaries using sophisticated electronic devices.
  - Facility and/or equipment shielding may also be required.
What are we protecting?

- **TEMPEST**
  - Study of the security of telecommunications devices that emit electromagnetic radiation.
  - TEMPEST originated as a code name of a classified study by the US Military in the late 1960’s.
  - Later the term became an Acronym for Telecommunications Electronics Material Protected from Emanating Spurious Transmissions.
• **TEMPEST**

   – Today the term also encompasses sound and mechanical vibrations.

• Basically any “signal” that could be exploited to compromise information. *(including unintentional radio or electrical signals, sounds, and vibrations)*
Who provides Guidance?

Committee on National Security Systems (CNSS)

- Sets policy for security of the US security systems.
- CNSSAM TEMPEST/1-13 (CNSS Advisory Memorandum), the RED/BLACK Installation Guidance. [Supersedes NSTISSAM TEMPEST/2-95 and TEMPEST/2-95 Addendum February 2000]
- The primary standard for structured cabling.
- Measures are also known as emissions security (EMSEC) which is a subset of communications security (COMSEC).
Who Approves?

- Certified TEMPEST Technical Authority (CTTA)
  - Experienced, technically qualified US Gov’t employee providing guidance/solutions for facilities, system and equipment identified as requiring TEMPEST countermeasures.
RED/BLOCK Installation Guidance - Concept

- **RED/BLOCK Installation Guidance (CNSSAM TEMPEST/1-13)**
  - Separating electrical and electronics circuits, components, equipment, and systems into:
    - **RED** - handles unencrypted Classified or what is called National Security Information (NSI).
    - **BLACK** - handles non-national security and properly encrypted NSI.

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RED/BLACK - Separation

Separation is composed of 2 parts:

- **Physical Separation** - RED/BLACK physical separation to decrease probability of EMI/EMR between RED and BLACK.

- **Electrical Separation** - Addresses signal distribution, power distribution, and grounding. Port-to-port isolation of switches is also applied.
RED/BLACK - Facility Considerations

• First steps in selection of proper RED/BLACK controls for the facility is:
  – Identify geographic location.
  – Level and type of Classified data processed.
  – Inspectable Space.
RED/BLACK – Physical Considerations

- Physical security is a key element in deciding which RED/BLACK countermeasures will be implemented.
- “Inspectable Space” is an important factor in determining necessary safeguards for equipment and systems that process NSI.
- Security officials, the CTTA, and/or others responsible for certifying the building should be involved in facility planning.
Inspectable Space

- **Definition**: amount of three dimensional space surrounding equipment that processes classified and/or sensitive information within which TEMPEST exploitation is not considered practical or where legal authority to identify and remove a potential TEMPEST exploitation exists and is exercised. This space is determined by the Certified TEMPEST Technical Authority (CTTA). **Often times the CTTA may require exceeding the minimum requirements due to specific threats.**
Inspectable Space

• Often times CTTA’s are overly cautious about required countermeasures. Countermeasure required are in CNSSI No. 7000 which is classified Confidential.
Inspectable Space Size

- Inspectable space is defined by the cognizant CTTA.
- Categorized by distance:
  - Less than 20 meters (m).
  - Greater than or equal to 20m, but less than 100m.
  - Equal to or greater than 100m.
Required 3 Levels of RED/BLACK Isolation

- 3 levels of RED/BLACK isolation Levels.
  - Level I - most stringent
  - Level II - less stringent
  - Level III - least stringent
- Levels correspond to the level of protection need to contain compromising emanations within inspectable space.
## RED/BLACK Requirements Level Matrix

This table is a random sample of the Requirement Level Matrix.

<table>
<thead>
<tr>
<th>Location</th>
<th>Classification Level</th>
<th>Inspectable Space (IS)</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the US</td>
<td>Collateral Secret and below</td>
<td>&lt; 20 meters</td>
<td>Table 4</td>
</tr>
<tr>
<td>Within the US</td>
<td>Special Category and Top Secret</td>
<td>&gt;= 100 meters</td>
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</tbody>
</table>

Table 4 is U//FOUO so levels are not shown.
### Facility RED/BLACK Physical Isolation

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Common Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED equipment to BLACK wires that connect to a transmitter.</td>
<td>1 m</td>
</tr>
<tr>
<td>RED equipment to BLACK wires that directly leave Inspectable Space (IS).</td>
<td>1 m</td>
</tr>
<tr>
<td>RED equipment to BLACK equipment with lines that leave IS.</td>
<td>1 m</td>
</tr>
<tr>
<td>RED equipment to BLACK wires that leave IS through digital switch.</td>
<td>50 cm</td>
</tr>
<tr>
<td>RED equipment to BLACK equipment with lines that connect to RF transmitter.</td>
<td>50 cm</td>
</tr>
<tr>
<td>RED wires to Black wires that leave the IS or connect to RF transmitter.</td>
<td>5 cm /15cm*</td>
</tr>
<tr>
<td>RED wires are shielded.</td>
<td>Yes</td>
</tr>
<tr>
<td>RED lines have distinguishing marking or color coding for identification.</td>
<td>Yes</td>
</tr>
<tr>
<td>RF wires such as CATV and satellite TV isolated within the IS.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* RED Parallel runs up to 30m to be separated by a minimum of 5 cm (2”). Runs with over 30m separation shall be 15 cm (6”). Cables crossing at 90deg shall be separated by 5 cm.

• Connectors to be a minimum of 5cm apart.
Equipment Separation – Telecommunications Room

- Equipment - RED Black Separation.
- Cabling - All levels of classified Red cabling can be run together. Red must be separated from Black.
RED Systems – Distribution & Patching

• Separate RED and Black Distribution panels.
• Separate distribution panels for each classification level of NSI and for each Special Category of NSI.
• Separate outlet boxes for RED and Black.
• Keyed connectors at both outlet and distribution panels, should be used for different classifications levels, unclassified levels and compartments of data, but is not mandatory.

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- Non-Keyed Fiber connectors require separation at the patch panels and outlet boxes for differing Classified systems.

- Keyed/Dissimilar Connectors are required if combination Outlets or Patch Panels are used.
Exceptions

- Fiber Cable
  - No Separation required. But outlet and Patch Panels may require separation if Dissimilar connectors are not used.
  - Some agencies will still require Red/Black Separation.

- Shielded
  - No separation required.
  - Most agencies will still require Separation.
  - When shielded cable is required, the wireline pairs or wireline bundles shall be individually shielded or shall have a minimum of one overall shield, and the cable shall have an outside non-conductive sheath. Screened cable is another term used for a cable with one overall shield. The shield shall be a non-ferrous metallic foil shield with an uninsulated and tinned drain wire or shall be a braided metallic shield with a minimum of 85 percent coverage. Except for coaxial cables, the shield shall not be used as a signal return or a signal carrying conductor.
**RED** Systems – Protected Distribution System

- **RED** cables traversing an area controlled to a lower level of classification or access control shall be in a Protected Distribution System (PDS) in accordance with NSTISSI No 7003 (not CNSSI No 7003, typo in Red/Black Reference).

- Request site specific requirements from CTTA. **DOCUMENT ALL** Direction provided.

- PDS Types:
  - **Simple** - constructed of wood, PVC or EMT.
  - **Hardened** - EMT, ferrous conduit or pipe, or rigid-sheet steel ducting
Protected Distribution System (PDS) - Example

Underground Special Requirements

- CONUS – Concrete encasement encouraged but not required
- OCONUS – 8 inches of concrete or steel container
- 1 meter deep minimum but greater depth may be required by CTTA
- MH’s with GSA Approved Lock or alarm.

Special Requirements

- Manhole covers Welded shut
- Since 9/11 some bases lock all manholes
- 8’ deep duct bank
- Common to apply OCONUS requirement in US.

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Access Areas and Threat Areas

• 3 levels of access areas are:
  – **Controlled Access Area (CAA)** - direct physical control within which unauthorized persons are denied access. Even with granted access they must be escorted by authorized persons or under continuous surveillance.
  – Special Type CAA - **Open Storage** is a secure room or vault that has met certain construction standards and PDS is not required inside.
Access Areas and Threat Areas – cont.

– **Limited Controlled Area (LCA)** - The space surrounding a PDS within which exploitation is not considered likely or legal authority to identify or remove a potential exploitation exists.

– **Uncontrolled Access Area** - An area open to the public. PDS required.
CATV and Satellite TV Isolation

- Cables shall be isolated before the cables leave the inspectable space.
- For SCIFs and SAPFs, the isolation must be within boundary of the SCIF or SAPF.
- May be achieved by:
  - convert copper wireline to fiber optic.
  - A 12 dB minimum gain one-way RF amplifier and a 12 dB min. loss RF attenuator inline with the cable.
CATV and Satellite TV Isolation

• Not required for receive-only systems entirely contained within inspectable space

• Cables that connect to audio/visual systems that also display NSI must meet electrical isolation requirements.
Power Considerations

- Requirement for RED power (power filter) determined by a CTTA.
- RF transmitters shall not be powered from same circuit as RED equipment.
- RED power distribution must be designed such that neither BLACK equipment nor utility equipment is connected to it.

- Need is dependent
  - On size Inspectable Space.
  - Location and size of transformer.
  - Presence of foreign nationals
  - Specific Threat

- Typical Power Filter application
  - Inside large Military Base in CONUS- None
  - Commercial Tenant Space- Filter
  - Overseas Base share with allies- Filter
Fortuitous Conductors

• CTTA may require isolation of fortuitous conductors.

• All pipes, conduits, ducts, and other metallic distribution systems that leave the inspectable space
  – Ground within inspectable space.
  Or
  – Non-conductive sections to be inserted
    • Electrical isolation
    • Acoustic isolation

• Unused cables that leave the inspectable space are to be removed or shortened to be contained within the inspectable space.
RED Systems - Cable Identification

- Must have prominently displayed distinguishing label, marking, or color that indicates the classification level and/or compartmentalization of the data.
- Identification to be located at both ends and at sufficient intervals as determined by the CTTA OR the entire cable may be the distinguishing color.

<table>
<thead>
<tr>
<th>SPECIAL COLOR CODING REQUIREMENTS FOR TELECOMMUNICATIONS SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELECOMMUNICATIONS (VOICE AND LAN) WIRING, CONNECTORS, DEVICES, CABLES, CONNECTORS, RACK, EQUIPMENT, ETC., SHALL BE PROVIDED IN THE COLOR AS INDICATED AS FOLLOWS: RACK/WAVES (CONDUIT), CABLE TRAYS, JUNCTION BOXES, WIRING/WAYS, AND EXTERIOR FIBER CABLES, SHALL BE COLOR CODED WITH ADHESIVE TAPE EVERY FEET.</td>
</tr>
<tr>
<td>SYSTEM</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>BLUE VOICE</td>
</tr>
<tr>
<td>BLACK LAN</td>
</tr>
<tr>
<td>GREEN LAN</td>
</tr>
<tr>
<td>RED LAN</td>
</tr>
<tr>
<td>YELLOW LAN</td>
</tr>
<tr>
<td>CABLE TV</td>
</tr>
</tbody>
</table>

- Table 1(U//FOUO) defines colors. Coordinate Colors with user.
- Identifying actual classifications may be not be allowed.
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Typical Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red-Black separation only</td>
<td>Red Black always separate.</td>
</tr>
<tr>
<td>Required if Black exits IS</td>
<td></td>
</tr>
<tr>
<td>Dielectric Breaks may be required by CTTA but no specific criteria is provided</td>
<td>Many CTTAs will require, though the effectiveness is questionable if shielded walls are not applied as well.</td>
</tr>
<tr>
<td>Alarmed Exterior PDS</td>
<td>Alarms rarely employed due to nuisance alarm.</td>
</tr>
</tbody>
</table>
Conclusion

Any questions?

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