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# **COLLECTIVE PROTECTION SYSTEM (CPS)**

## **TRAINING MANUAL**

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## **INTRODUCTION**

The introduction and definitions from the basic and Advanced Damaged Control PQS books are valid for this manual. This manual was written to be applicable for all CPS equipped ships. Ships should tailor this manual by deleting those portions of the equipment/components not installed on that ship. All the references are listed with each section to facilitate cross checking.

Any comments or recommendations should be forwarded to Mr. Jeff Middleton, NSWCCD-SSES Phila. Code 9213.

## POINTS OF CONTACT

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## 3 **INTRODUCTION TO FUNDAMENTALS**

### 3.1 **Introduction**

This training manual begins with a fundamental section covering the basic knowledge and principles needed to understand the CPS equipment and duties. Normally, you would have acquired the knowledge of the fundamental section during new construction familiarization training. If you did not receive this training or if you need a refresher, the references listed at the beginning of each fundamental will aid you in a self –study program. All references cited for study are selected according to their creditability and availability.

### 3.2 **Safety**

Because safety is of paramount consideration, the first subsection of fundamentals describes the safety precautions, which apply throughout this manual. This permits a subsequent listing in the Systems sections of those safety precautions unique to a given system.

#### 4. **SAFETY PRECAUTIONS FUNDAMENTALS**

##### 4.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- g. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, **DDG Class Only**.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

##### 4.2 Answer the following questions:

- 4.2.1 State the safety precautions for opening a water tight door to a air/pressure lock. (Ref. c, j).
- 4.2.2 State the Safety precautions for opening the cleanside or dirtyside plenum doors to a CPS fan room. (Ref. f, g)
- 4.2.3 Discuss the safety precautions for operation of a motorized or manual damper down stream of the high-pressure fans and operation of the high-speed fans. (LHD, LHA and AOE) (Ref. f, g)
- 4.2.4 What are the normal routes for entering and leaving a CPS zone in a CBR environment and a non-CBR threat environment. (Ref. c)
- 4.2.5 Discuss the safety precautions to be taken when entering the CPS fan room for inspection or maintenance. (Ref. f, g)
- 4.2.6 Discuss the hazards of low CPS pressure. (Ref. c)
- 4.2.7 Discuss the damage of high-pressure differential across the CBR filters and hazard of putting filter closure covers on the filter housing while the fan is running. (Ref. f, g)
- 4.2.8 Discuss the safety precautions to be taken when changing CBR filters after a CBR attack. (Ref. f, g)

## 5. COLLECTIVE PROTECTION SYSTEM (CPS) FUNDAMENTALS

### 5.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- h. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 5.2 Answer the following questions:

#### 5.2.1 Explain the following terms associated with CPS. (Ref. c)

- a. CPS Types of Coverage
- b. CPS Levels of Protection
- c. CPS Zone
- d. CPS Filtration
- e. CPS Pressurization
- f. Controlled Access

#### 5.2.2 Describe the following major components, which make up the Collective Protection System. (Ref. c)

- a. CPS Air Tight Boundary
- b. Air Lock
- c. Pressure Lock
- d. CPS Decon Station
- e. CPS Total Protection Supply System
- f. Pressure Control Valve
- g. CPS Alarm System (Ref. a, h)

#### 5.2.3 Define airtight integrity. (Ref. b, c)

#### 5.2.4 Explain how pressure is maintained in a CPS zone. (Ref. f, g)

## 5. **COLLECTIVE PROTECTION SYSTEM (CPS) FUNDAMENTALS**

- 5.2.5 State the ship's evolutions, which are normally conducted that will cause the CPS zone pressure to depressurize. (Ref. c)
- 5.2.6 Identify the level and type of CPS zones and zone boundaries in your ship. (Ref. h)
- 5.2.7 Who authorizes CPS zones to be de-pressurized? (Ref. a, c)
- 5.2.8 Discuss how CPS is set and checked. (Ref. f, g)

## 6. CPS – DAMAGE CONTROL FUNDAMENTALS

### 6.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- i. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 6.2 Answer the following questions:

- 6.2.1 What is the proper procedure for crossing a CPS zone boundary in an emergency? to conduct damage control and fire fighting actions.
- 6.2.2 Discuss how ventilation should be controlled for smoke removal in a CPS zone and adjacent zone.
- 6.2.3 Discuss how ventilation should be controlled during a fire in a CPS zone while in a CBR environment.
- 6.2.4 Discuss how fire hoses should be rigged across an air lock to fight fires.
- 6.2.5 Discuss how damaged bulkheads and decks can be patched to retain CPS zone pressure.

## 7. CPS – CBR FUNDAMENTALS

### 7.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- j. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 7.2 Answer the following questions:

- 7.2.1 Discuss the procedure for self-protection if CPS zone pressure is lost.  
(Ref. a, c, f and g)
- 7.2.2 What is the procedure in a CBR environment for existing the CPS zone?  
(Ref. c)
- 7.2.3 What is the procedure, in a CBR environment for entering a CPS zone?  
(Ref. c)
- 7.2.4 What is the procedure, in a CBR environment for handling injured personnel?  
(Ref. a, j)
- 7.2.5 State the protective measures to be taken at each MOPP level in a CPS ship.  
(Ref. a, c, and k)

## 8. INTRODUCTION TO SYSTEMS

- 8.1 **Basic Building Blocks.** In this section, the equipment is broken down into smaller, more comprehensible, functional systems, as the basic building blocks in the learning process. Each system is written to reflect specific requirements by identifying the equipment most relevant to one or more designated watchstanders. The less complex systems may be identified and covered quickly or related to a lower priority to permit greater emphasis on more significant or complete systems.
- 8.2 **Components And Component Parts.** Each system is disassembled, for learning, into two levels. Systems have components and components have parts. Don't expect every item appearing on a parts list to be listed in the technical manual. Only those items, which must be understood for operation/maintenance, are listed. Normally a number of very broad (overview) system are disassembled into their components parts with the big picture as the learning goal. Items listed as components in such a system may then be analyzed as separate systems and broken down into components and component parts.
- 8.3 **Format.** Each system is organized within the following format.
- a. It lists the references to be used for study.
  - b. It asks you to explain the function of the system.
  - c. it asks for static facts of what or where the components and Component parts are in relation to the system.
  - d. It directs attention to the dynamics or how the components and Component parts operate to make the system function.
  - e. It specifies the parameters that must be immediately recalled.
  - f. It requires study of the relationship between the system being studied and other systems or areas.
  - g. It requires discussion of safety devices which protect the system, as well as unique safety precautions that apply to personnel and equipment.

## 9. CPS Ventilation System

### 9.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- k. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 9.2 FUNCTION

- a. What is the function of this system?

### SYSTEM COMPONENTS AND COMPONENT PARTS

Referring to a standard print of this system or the actual equipment, identify the following system components and component parts and discuss the designated item for each.

- a. What is its function?
- b. Where is it located?
- c. What are the sources of power?
- d. What protection is provided by the component?

|   | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> |
|---|----------|----------|----------|----------|
| 9.2.1 CPS fan rooms                         | X        | X        | X        | X        |
| 9.2.2 Pressure Control Valves               | X        | X        | X        | X        |
| 9.2.3 CPS Alarm System                      | X        | X        | X        | X        |
| 9.2.4 HP/LP Compressor CBR Filter           | X        |          |          | X        |
| 9.2.5 CPS Zone Boundary Bulkheads and Decks | X        | X        |          | X        |

## 9. CPS Ventilation System

### 9.3 PRINCIPLES OF OPERATION

- a. How do the components work together to achieve the system's function?
- b. What indications will you receive if the system is malfunctioning?

### 9.4 PARAMETERS/OPERATING LIMITS

- a. What is the normal operating valve
- b. What is the allowable operating limits?
- c. What is physical location of the indicators?
- d. What is the alarm set points?
- e. Where are the parameters sensed or monitored?

|                              | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> |
|------------------------------|----------|----------|----------|----------|----------|
| 9.4.1 CPS zone pressure      | X        | X        | X        |          | X        |
| 9.4.2 CPS alarm system       | X        |          | X        | X        | X        |
| 9.4.3 CPS fan control        |          |          | X        |          |          |
| 9.4.4 Pressure control valve | X        |          |          |          |          |

### 9.5 SYSTEM INTERFACE

- 9.5.1 How do the following outside influences affect the operation of this system.
- a. Loss of electrical power
  - b. Fire
  - c. Flooding
  - d. Dirt
  - e. Lack of maintenance
  - f. Battle damage
  - g. CBR agents
  - h. How does this system interface with the drain system?

### 9.6 SAFETY PRECAUTIONS

- 9.6.1 What special safety precautions apply to:

- a. Securing of ventilation for a fire
- b. Desmoking a compartment
- c. Installed ventilation
- d. portable desmoke blowers

- 9.6.2 How does this system affect the health and comfort of the crew?

- 9.6.3 What are the safety precautions and procedures to dispose of contaminated filters?

10. **AIR/PRESSURE LOCK**

10.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- l. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

10.2 **FUNCTION**

10.2.1 What is the function of this system?

10.3. **SYSTEM COMPONENTS AND COMPONENT PARTS**

Referring to a standard print of this system or the actual equipment, identify the following system Components and Component parts and discuss the designated item for each.

- a. What is the function?
- b. Where is it located?
- c. What protection is provided by this component?

|                                     | <u>A</u> | <u>B</u> | <u>C</u> |
|-------------------------------------|----------|----------|----------|
| 10.3.1 Air lock: Type I, II and III | X        | X        |          |
| 10.3.2 Air sweep                    | X        | X        | X        |
| 10.3.3 Pressure lock                | X        | X        |          |
| 10.3.4 Special air lock             | X        | X        |          |
| 10.3.5 CPS DECON station            | X        | X        |          |

10.4 **PRINCIPLES OF OPERATION**

10.4.1 How do the components work together to achieve the system's function?

10.4.2 What indications will you receive if the system is malfunctioning?

10. **AIR/PRESSURE LOCK**

10.5 **PARAMETERS /OPERATING LIMITS**

For the items listed answer the following questions:

- a. What is the normal operating valve.
- b. what are the allowable operating limits

10.5.1 a. Air/Pressure locks (pressure/flow)

|   |   |
|---|---|
| A | B |
| X | X |

10.6 **SYSTEM INTERFACE**

10.6.1 How do the following outside influences affect the operation of the system:

- a. Loss of electrical power
- b. Fire
- c. Flooding
- d. Lack of maintenance
- e. Battle damage
- f. CBR environment
- g. How does this system interface with the fire main system?
- h. How does this system interface with the CPS ventilation system?

10.7 **SAFETY PRECAUTIONS**

10.7.1 What special safety precautions apply to:

- a. Operating air/pressure lock doors.

10.7.2 How does this system affect the health and comfort of the crew?

## 11. CPS Decontamination Stations

### 11.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- m. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 11.2 FUNCTION

11.2.1 What is the function of this system?

### 11.3. SYSTEM COMPONENTS AND COMPONENT PARTS

Referring to a standard print of this system or the actual equipment, identify the following system components and component parts and discuss the designated item for each:

- a. What is its function?
- b. Where is it located?
- c. What are the sources of power?
- d. What protection is provided by the component?

|   | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> |
|---|----------|----------|----------|----------|
| 11.3.1 CPS Decontamination Stations     | X        | X        | X        | X        |
| 11.3.2 Fresh water Decon deluge showers | X        | X        |          |          |
| 11.3.3 Salt water Decon deluge showers  | X        | X        | X        | X        |
| 11.3.4 Air sweeps                       | X        | X        |          | X        |
| 11.3.5 Outer Clothing Undressing Area   | X        | X        |          |          |
| 11.3.6 Inner Clothing Undressing Area   | X        | X        |          |          |
| 11.3.7 Contamination Purge Lock         | X        | X        |          |          |
| 11.3.8 Control Area                     | X        | X        |          |          |

## 11. CPS Decontamination Stations

### 11.4 PRINCIPLES OF OPERATION

11.4.1 How do the components work together to achieve the system's function?

11.4.2 What indications will you receive if the system is malfunctioning?

### 11.5 PARAMETERS/OPERATING LIMITS

For the items listed answer the following questions:

- a. What is the normal operating value?
- b. What are the allowable operating limits?
- c. What is the physical location of the indicators?
- d. What is the alarm setpoint?
- e. Where are the parameters sensed or monitored?

11.5.1 Salt water shower pressure

11.5.2 CPS zone pressure/sweep air flow

| A | B | C | D | E |
|---|---|---|---|---|
| X |   | X |   |   |
| X | X | X | X | X |

### 11.6 SYSTEM INTERFACE

11.6.1 How do the following outside influences affect the operation of the system.

- a. Loss of electrical power
- b. Fire
- c. Flooding
- d. Dirt
- e. Lack of maintenance
- f. Battle damage
- g. CBR agents
- h. How does this system interface with the drain system?
- i. How does this system interface with the fire main system?
- j. How does this system interface with the CPS ventilation system?

### 11.7 SAFETY PRECAUTIONS

11.7.1 What special safety precautions apply to:

- a. Personnel decontamination
- b. Operation of CPS DECON station doors

11.7.2 How does this system affect the health and comfort of the crew?

11.7.3 What are the safety precautions and procedures to dispose of CBR contaminants?

## 12. CPS Fan Rooms

### 12.1 References:

- a. NWP 3-20.31
- b. NSTM 079 Vol II & Vol III
- c. NSTM 470 Vol I
- d. NSTM 555
- e. New Construction Familiarization Training Program, HVAC System, Student Guide.
- f. Navy Shipboard Collective System (CPS) Technical Manual, 20 Oct. 98, SS200-Af-MMM-010.
- n. Navy Shipboard Collective System (CPS) Technical Manual, NAVSEASS-200-AR-MMO-010, DDG Class Only.
- h. Ships Information Book (SIB)
- i. Ships Damage Control Book
- j. NAVMED P-5041
- k. Damage Control PQS, NAVEDTRA 43119-2H
- l. CPS PMS 5121

### 12.2 FUNCTION

12.2.1 What is the function of this system?

### 12.3. SYSTEM COMPONENTS AND COMPONENT PARTS

Referring to a standard print of this system or the actual equipment, identify the following system components and component parts and discuss the designated item for each:

- a. What is its function?
- b. Where is it located?
- c. What are the sources of power?
- d. What protection is provided by the component?

|   | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> |
|---|----------|----------|----------|----------|
| 12.3.1 Anti-blast damper                        | X        | X        |          | X        |
| 12.3.2 Prefilter                                | X        | X        |          | X        |
| 12.3.3 Preheater                                | X        | X        | X        |          |
| 12.3.4 Dirtyside inlet plenum                   | X        | X        |          |          |
| 12.3.5 HEPA filters                             | X        | X        |          | X        |
| 12.3.5 Charcoal filter                          | X        | X        |          | X        |
| 12.3.7 CBR filter bank                          | X        | X        |          | X        |
| 12.3.8 Cleanside outlet plenum                  | X        | X        |          |          |
| 12.4.9 Access to cleanside and dirtyside plenum | X        | X        |          |          |
| 12.4.10 High pressure CPS supply fans           | X        | X        | X        | X        |
| 12.4.11 Manual Dampers                          | X        | X        | X        | X        |

## 12. CPS Fan Rooms

### 12.5 PRINCIPLES OF OPERATION

- 12.5.1 How do the components work together to achieve the system's function?
- 12.5.2 What indications will you receive if the system is malfunctioning?
- 12.5.3 How and when are the CBR filters changed in a non-CBR environment?
- 12.5.4 How and when are contaminated CBR filters changed?
- 12.5.5 How and when are prefilters cleaned?
- 12.5.6 How and when are motorized and manual dampers operated?

### 12.6 PARAMETERS/OPERATING LIMITS

For the items listed answer the following questions:

- a. What is the normal operating value.
- b. What are the allowable operating limits?
- c. What is the physical location of the indicators?
- d. What is the alarm setpoint?
- e. Where are the parameters sensed or monitored?

|   | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> |
|---|----------|----------|----------|----------|----------|
| 12.6.1 Prefilter delta pressure             | X        | X        | X        |          | X        |
| 12.6.2 CBR filter delta pressure            | X        | X        | X        |          | X        |
| 12.6.3 CPS high pressure fan flow indicator | X        |          | X        |          |          |
| 12.6.4 CPS zone pressure                    | X        | X        | X        | X        | X        |
| 12.6.5 Prefilter flow                       | X        |          |          |          |          |
| 12.6.6 CBR filter flow                      | X        |          |          |          |          |

### 12.7 SYSTEM INTERFACE

- 12.7.1 How do the following outside influences affect the operation of this system:
  - a. Loss of electrical power
  - b. Fire
  - c. Flooding
  - d. Dirt
  - e. lack of maintenance.
  - f. Battle damage
  - g. CBR agents
  - h. How do variations in temperature and humidity affect the operation of this system?
  - i. How does this system interface with a repair locker
  - j. How does this system interface with the drain system
  - k. How does this system interface with the CPS ventilation system?
    - l. Repairing CPS high pressure fans
  - m. Changing CBR filters
  - n. Cleaning prefilters

12. **CPS Fan Rooms**

12.8 **SAFETY PRECAUTIONS**

12.8.1 What special safety precautions apply to:

- a. Securing of ventilation for a fire
- b. Desmoking a compartment
- c. Changing contaminated CBR filters
- d. Opening plenum doors
- e. Closing manual dampers and operating fans
- f. Opening fan room doors

12.8.2 How does this system affect the health and comfort of the crew?

12.8.3 What are the safety precautions and procedures to dispose of CBR contaminants.