INTERPLANT STANDARD-STEEL INDUSTRY		
IPSS	**CODE OF PRACTICE FOR MAINTENANCE OF H.T. ac CIRCUIT BREAKERS**	**IPSS: 1-04-050-08**
	Corresponding IS does not exist	

0. FOREWORD: This Inter Plant Standard has been prepared by the Standards Committee on Switchgear and Controlgear, IPSS 1:4 with the active participation of the representatives of the steel plants, major consulting organizations and was adopted in November 2008.

1. *INTRODUCTION:*

1.1 The maintenance of circuit breakers deserve special consideration because of the importance for routine switching and for protection of the equipments. High voltage ac Circuit Breakers are manufactured under a high degree of quality control, of the best materials available, and with a high degree of tooling for operational accuracy. Manufacturer's tests show these circuit breakers to have durability beyond the minimum standards requirements. All of these factors give these circuit breakers a very high reliability rating. However, because of the varying application conditions and the dependence placed upon them for protection of electrical systems and equipment as well as the assurance of service continuity, inspections and maintenance checks must be made on a regular basis.

1.2 Maintenance of these breakers will generally consist of keeping them clean and properly lubricated. The frequency of maintenance will depend to some extent on the cleanliness of the surrounding area. If there were very much dust, lint, moisture, or other foreign matter present then obviously more frequent maintenance would be required. Manufacturers of such circuit breakers normally recommend inspection & maintenance of the circuit breaker after certain intervals which, varies from six months to one year and also depends upon the environmental condition. Load condition vis a vis the rated capacity, number of faults cleared and number of normal operation also determine the frequency of maintenance.

2. SCOPE:

2.1 The idea of this document is to provide a general guideline to the maintenance personnel of steel plants for carrying out maintenance of high voltage ac circuit breakers. This IPSS standard for maintenance of ac circuit breakers covers high voltage ac circuit breakers only.

2.2 The Routine Maintenance Procedures of HT ac Circuit Breakers are given at Appendix-A, Appendix-B and Appendix-C.

CODE OF PRACTICE FOR MAINTENANCE OF HT a.c. CIRCUIT BREAKERS

VACUUM CIRCUIT BREAKER

CHECK LIST :

(A) POWER PORTION OF SWITCHGEAR :

1) Cleaning & tightness of :
a) Power Contacts of I/C & O/G side
b) Shrouds & supporting insulators of I/C & O/G side
c) Vacuum Interrupter Bottles
d) Transmission / Switching lever / Tie rod
e) Shock Absorber / PU bushes
f) Surge Suppressors
2) Greasing of :
a) Power Contacts of I/C & O/G side
b) Shock absorber
3) Replacement if any :

(B) OPERATING MECHANISM OF SWITCHGEAR :

1) Cleaning, tightness, greasing & adjustment of :
a) Spring charging motor & its gear mechanism
b) Motor limit switch assembly
c) Closing coil & its assembly
d) Tripping coil & its assembly
e) Tripping coil no.-2, if available
f) Auxiliary contacts
g) Main Shaft / Operating rod
h) Closing, tripping & other springs
i) Control block of the breaker
2) Setting of :
a) All springs tension :
b) Levers
3) Replacement if any :

(C) TROLLEY/TRUCK OF THE SWITCHGEAR :

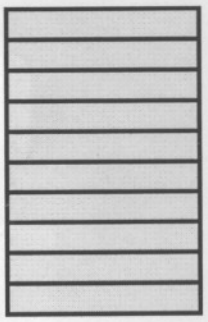
1) Cleaning, tightness, greasing & adjustment of :
a) All four wheels
b) Insert & Drawing out mechanism
c) Metallic body
d) Earthings :
2) Replacement if any :

(D) FRONT PORTION OF THE PANEL :

1) Cleaning, tightness, greasing & adjustment of :
a) Shutter mechanism
b) Earthings
c) Service, test & door limit switches
d) Control block of the panel
2) Replacement if any :

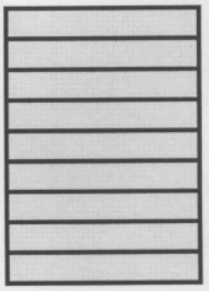
(E) REAR PORTION OF THE PANEL :

1) Cleaning, tightness & adjustment of :
a) Outgoing Power Contacts & bus-bars
b) C.T. Primary & Secondary terminals
c) Cable end termination
d) Core Balanced C.T., if applicable.
e) Space heater
f) Thermostat
g) Earthings
2) Insulation of end joint :
3) Blocking of accessed holes and opening
4) Replacement if any :



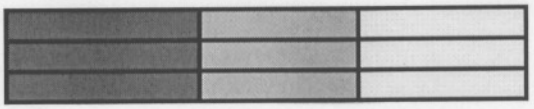
(F) CONTROL, METERING & RELAY PANEL :

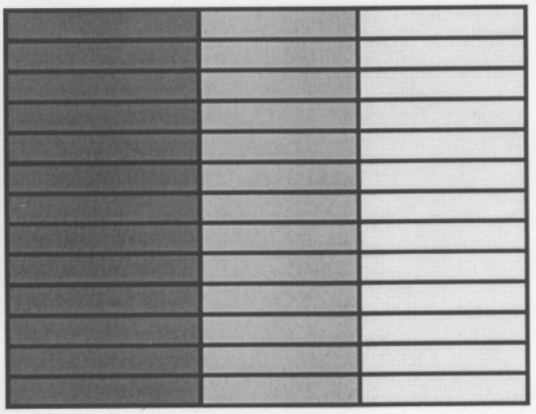
1) Cleaning, checking & tightness of :
a) Terminal blocks
b) M.C.B.s
c) HRC fuses & resistances
d) Control contactors
e) Metering terminals
f) Relay terminals
g) Control cables clamping
h) Control earthing
2) Replacement if any :



(G) TESTING OF THE SWITCHGEAR :

1) Insulation Resistance Test :(I.R.Values for 60/15 seconds)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Top and bottom of each pole :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
2) Power Contacts continuity of all three poles
3) ac High Voltage Test :
(i)Voltage Amplitude in kV :
(ii) Time in Seconds :
(iii) Measurement of leakage current in microAmps
4) Insulation Resistance Test after ac high voltage:(60/15 sec)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Top and bottom of each pole :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
5) Contacts Resistance Measurement in microohms :
6) Closing time in milliseconds :
7) Tripping time in milliseconds :





ROUTINE MAINTENANCE OF SF6 CIRCUIT BREAKER

CHECK LIST :

(A) POWER PORTION OF SWITCHGEAR :

1) Cleaning , tightness & adjustment of :
a) Power Contacts of I/C & O/G side
b) Shrouds & insulators of I/C & O/G side
c) Pressure switches
d) Transmission lever / Switching lever / Tie rod of poles
e) Shock Absorber / PU bushes
2) Greasing of:
a) Power Contacts of I/C & O/G side
b) Shock absorber
3) Checking of gas leakages by gas leakage detector
4) Filling of gas in any pole :
5) Replacement if any :

(B) OPERATING MECHANISM OF SWITCHGEAR :

1) Cleaning, tightness, greasing & adjustment of :
a) Spring charging motor & its gear mechanism
b) Motor limit switch assembly
c) Closing coil & its assembly
d) Tripping coil & its assembly
e) Tripping coil no.-2, if available
f) Auxiliary contacts
g) Main Shaft / Operating rod
h) Closing, tripping & other springs
i) Control block of the breaker
2) Setting of :
a) All springs tension :
b) Levers
3) Replacement if any :

(C) TROLLEY OF THE SWITCHGEAR :

1) Cleaning, tightness, greasing & adjustment of :
a) All four wheels
b) Insert & Drawing out mechanism
c) Metallic body
d) Earthings :
2) Replacement if any :

(D) FRONT PORTION OF THE PANEL :

1) Cleaning, tightness, greasing & adjustment of :
a) Shutter mechanism
b) Earthings
c) Service, test & door limit switches
d) Control block of the panel
2) Replacement if any :

(E) REAR PORTION OF THE PANEL :

1) Cleaning, tightness & adjustment of :
a) Outgoing Power Contacts & bus-bars
b) C.T. Primary & Secondary terminals
c) Cable end termination
d) Core Balanced C.T., if applicable.
e) Space heater
f) Thermostat
g) Earthings
2) Insulation of end joint :
3) Blocking of accessed holes and opening
4) Replacement if any :

(F) CONTROL, METERING & RELAY PANEL :

1) Cleaning, checking & tightness of :
a) Terminal blocks
b) M.C.B.s
c) HRC fuses & resistances
d) Control contactors
e) Metering terminals
f) Relay terminals
g) Control cables clamping
h) Control earthing
2) Replacement if any :

(G) TESTING OF THE SWITCHGEAR :

1) Insulation Resistance Test :(I.R.Values for 60/15 seconds)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Phase to earth :
(ii)Phase to phase :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
2) Power Contacts continuity of all three poles
3) ac High Voltage Test :
(i)Voltage Amplitude in kV :
(ii) Time in Seconds :
(iii) Measurement of leakage current in microAmps
4) Insulation Resistance Test after ac high voltage:(60/15 sec)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Top and bottom of each pole :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
5) Contacts Resistance Measurement in microohms :
6) Closing time in milliseconds :
7) Tripping time in milliseconds :

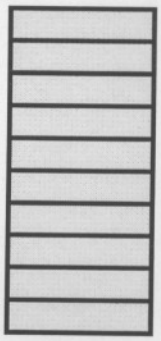
Appendix - C

MINIMUM OIL CIRCUIT BREAKER ROUTINE MAINTENANCE

CHECK LIST :

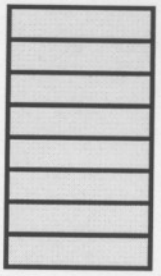
(A) POWER PORTION OF SWITCHGEAR :

1) Cleaning & tightness of :
a) Power Contacts of I/C & O/G side
b) Shrouds & insulators of I/C & O/G side
c) Oil gauge :
d) Transmission lever / Switching lever / Tie rod of the poles
e) Shock Absorber
2) Greasing of :
a) Power Contacts of I/C & O/G side
b) Shock absorber
3) Topping up of oil in the pole upto recommended level :
4) Replacement of oil totally every year.
5) Replacement of oil after 3 short circuits.



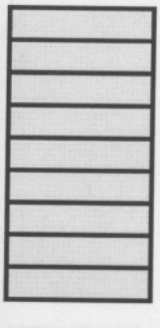
(B) FOR CAPITAL REPAIR OF MOCB :

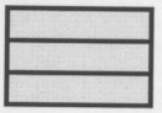
1) Cleaning, tightness, greasing & adjustment of :
a) Fixed Contacts of all three poles
b) Moving Contacts of all three poles
c) Arcing contacts of all three poles
d) Metallic / Plastic guide shoes
e) Arc splitting chamber
f) Condition of splitting / circlip pins
g) Pole body
2) Replacement if any :



(C) OPERATING MECHANISM OF SWITCHGEAR :

1) Cleaning, tightness, greasing & adjustment of :
a) Spring charging motor & its gear mechanism
b) Motor limit switch assembly
c) Closing coil & its assembly
d) Tripping coil & its assembly
e) Tripping coil no.-2, if available
f) Auxiliary contacts
g) Main Shaft / Operating rod
h) Closing, tripping & other springs
i) Control block of the breaker
2) Setting of :
a) All springs tension :
b) Levers
3) Replacement if any :





(D) TROLLEY/TRUCK OF THE SWITCHGEAR :

1) Cleaning, tightness, greasing & adjustment of :
a) All four wheels
b) Insert & Drawing out mechanism
c) Metallic body
d) Lubricating by petroleum jelly of sliding earthing contacts.
2) Replacement if any :

(E) FRONT PORTION OF THE PANEL :

1) Cleaning, tightness, greasing & adjustment of :
a) Shutter mechanism
b) Earthing jumpers
c) Service, test & door limit switches
d) Control block of the panel
2) Replacement if any :

(F) REAR PORTION OF THE PANEL :

1) Cleaning, tightness & adjustment of :
a) Outgoing Power Contacts & bus-bars
b) C.T. Primary & Secondary terminals
c) Cable end termination, insulation & lugs.
d) Core Balanced C.T., if applicable.
e) Space heater
f) Thermostat
g) Earthing jumpers
2) Insulation of end joint :
3) Blocking of accessed holes and opening
4) Replacement if any :

(G) CONTROL, METERING & RELAY PANEL :

1) Cleaning, checking & tightness of :
a) Terminal blocks
b) M.C.B.s
c) HRC fuses & resistances
d) Control contactors
e) Metering terminals
f) Relay terminals
g) Control cables clamping
h) Control earthing
2) Replacement if any :

(H) TESTING OF THE SWITCHGEAR :

1) Insulation Resistance Test :(I.R.Values for 60/15 seconds)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Top and bottom of each pole :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
2) Power Contacts continuity of all three poles
3) ac High Voltage Test :
(i)Voltage Amplitude in kV :
(ii) Time in Seconds :
(iii) Measurement of leakage current in microAmps
4) Insulation Resistance Test after ac high voltage:(60/15 seconds)
(With a 2.5 kV Megger)
a) Switchgear open position :
(i) Top and bottom of each pole :
b) Switchgear closed position :
(i) Phase to earth :
(ii)Phase to phase :
4) Contacts Resistance Measurement in microohms :
5) Closing time in milliseconds :
6) Tripping time in milliseconds :