Air Quality Index – An Overview

Environment Surveillance Centre

Madhya Pradesh Pollution Control Board

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Air Quality Index

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AQI

- Air Quality Index is a tool for effective communication of air quality status to people in terms, which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.

02

AQI is useful for

- General public to know air quality in a simplified way,
- A politician to invoke quick actions,
- A decision maker to know the trend of events and to chalk out corrective pollution control strategies,
- A government official to study the impact of regulatory actions, and
- A scientist engaged in research using air quality data.

Categories of AQI

AQI Category	AQI range	Color code
Good	0 - 50	
Satisfactory	51 - 100	
Moderate	101 - 200	
Poor	201 - 300	
Very Poor	301 - 400	
Severe	401 - 500	

Based on ambient concentration of air pollutants and their health breakpoints.

Health Breakpoints

AQI Category	AQI	Concentration Range*							
		PM_{10}	$PM_{2.5}$	NO_2	O_3	CO	SO_2	NH_3	Pb
Good	0-50	0-50	0-30	0–40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory	51 - 100	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5-1.0
Moderately Polluted	101-200	101-250	61-90	81-180	101-168	2.1-10	81-380	401-800	1.1-2.0
Poor	201-300	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very Poor	301–400	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe	401-500	430+	250+	400+	748+*	34+	1600+	1800+	3.5+

* CO in mg/m^3 and other pollutants in $\mu g/m^3$; 24-hourly average values for PM_{10}, $PM_{2.5}$, NO_2, SO_2, NH_3, and Pb, and 8-hourly values for CO and O_3.

Health Impact of AQI Categories

AQI	Possible Health Impacts
Good	minimal impact
Satisfactory	minor breathing discomfort to sensitive people
Moderate	breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor	breathing discomfort to people on prolonged exposure and discomfort to people with heart disease with short exposure
Very Poor	respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
Severe	respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases

Air Quality Monitoring Network in M.P.

A network of web-based Real-time Monitoring (RTM) system is designed to provide AQI on real time basis. It is an automated system that captures data from RTM stations without human intervention, and displays AQI based on running average values

- **43 RTM locations in 23 of the 55 districts in the State**
- **7 Non Attainment Cities comprising 23 monitoring locations**
- **15 of the 43 locations are owned by MPPCB**
- **28 locations are supported by Industries**

AQI Criteria Parameters	
Particulate Matter PM_{10}	Benzene
Particulate Matter $PM_{2.5}$	Lead
Nitrogen dioxide	Arsenic
Sulphur dioxide	Nickel
Carbon monoxide.	Benzopyrene
Ozone	
Ammonia	

Owing to real-time monitoring limitations and practical consideration only seven parameters are considered.

Limitations in AQI Calculation

- **Availability of standards allow only 7 criteria parameters for AQI calculation**
- **Ni, NH_3, Benzene & Benzo pyrene have only annual standards**
- **CO & O_3 have short-term standards only**
- **Pb, Ni, As & Benzopyrene are analyzed through manual system**
- **For AQI, data is fed directly from the analyser without scrutiny.**
- **Issues of Power cuts, Internet outage, Maintenance etc**
- **AQI dissemination involves multiple steps, viz. operation of sensors, analysers, calibration, data acquisition, data transmission etc which may disrupt transmission continuity.**

AQI Calculation Criteria

CPCB Legal Information Portal
Central Pollution Control Board
Ministry of Environment, Forest and Climate Change, Government of India

How is AQI calculated?

1. The Sub-indices for individual pollutants at a monitoring location are calculated using its 24-hourly average concentration value (8-hourly in case of CO and O3) and health breakpoint concentration range. The worst sub-index is the AQI for that location.

2. All the eight pollutants may not be monitored at all the locations. Overall AQI is calculated only if data are available for minimum three pollutants out of which one should necessarily be either PM2.5 or PM10. Else, data are considered insufficient for calculating AQI. Similarly, a minimum of 16 hours' data is considered necessary for calculating sub index.

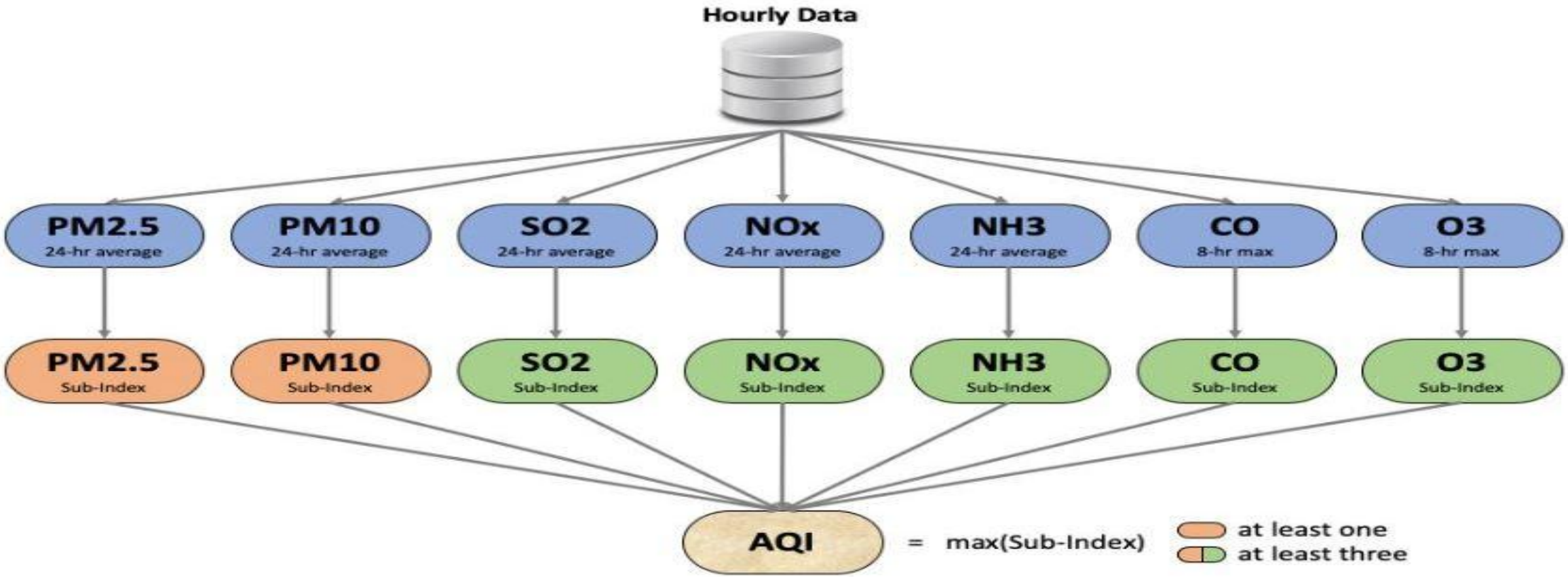
3. The sub-indices for monitored pollutants are calculated and disseminated, even if data are inadequate for determining AQI. The Individual pollutant-wise sub-index will provide air quality status for that pollutant.

4. The web-based system is designed to provide AQI on real time basis. It is an automated system that captures data from continuous monitoring stations without human intervention, and displays AQI based on running average values (e.g. AQI at 6am on a day will incorporate data from 6am on previous day to the current day).

5. For manual monitoring stations, an AQI calculator is developed wherein data can be fed manually to get AQI value.

PMNRF PRIME MINISTER'S National Relief Fund
NDF NATIONAL DEFENCE FUND
mygov मेरी सरकार
MAKE IN INDIA
digital india CALL FOR NOMINATIONS
Digital India

AQI criteria explained



- The AQI calculation uses 7 measures: **PM2.5, PM10, SO2, NOx, NH3, CO and O3**.
- For **PM2.5, PM10, SO2, NOx and NH3** the average value in last 24-hrs is used with the condition of having at least 16 values.
- For **CO and O3** the maximum value in last 8-hrs is used.
- Each measure is converted into a Sub-Index based on pre-defined groups.
- Sometimes measures are not available due to lack of measuring or lack of required data points.
- Final AQI is the maximum Sub-Index with the condition that at least one of PM2.5 and PM10 should be available and at least three out of the seven should be available.

AQI data validation criteria

- Data of instrument calibration period is not considered.
- Maintenance and testing period data is discarded.
- Valid range of Data (capping limit of individual parameter) :
  - $PM_{2.5}$ – 3.0 to 900.00 ug/m^3
  - PM_{10} – 3.0 to 900.00 ug/m^3
  - CO – 0.1 to 55.00 mg/m^3
  - NO_2 – 0.1 to 500.00 ug/m^3
  - SO_2 – 0.1 to 1000.00 ug/m^3
  - O_3 – 0.1 to 1000.00 ug/m^3
  - NH_3 – 0.1 to 1000.00 ug/m^3

Calculation of AQI

- Data of minimum three pollutants is necessary
- One of the three pollutants should be $PM_{2.5}$ or PM_{10}
- Minimum 16 hour data of each parameter is required
- CO & O_3 are measured on 8 hour basis
- Rest of the parameters are measured on 24 hour basis
- The Sub-indices for individual pollutants are calculated using its 24-hourly average concentration value.
- The worst sub-index is taken as the AQI for that location.

CPCB AQI Calculator

Date		Station	NSIT
DD-MM-YYYY		City	Delhi
		State	Delhi

Pollutants		concentration in µg/m3 (except for CO)	Sub-Index	check
PM10	24-hr avg	200.00	167	1
PM2.5	24-hr avg	75.00	150	1
SO2	24-hr avg	18.00	23	1
NOx	24-hr avg	8.00	10	1
*CO (mg/m3)	max 8-hr	0.00	0	0
O3	max 8-hr	113.00	119	1
NH3	24-hr avg	34.00	9	1

Air Quality Index

AQI = 167

* Concentrations of minimum three pollutants are required; one of them should be PM10 or PM2.5

* The check displays "1" when a non-zero value is entered

24 hour raw data of each pollutant

Station : Pithampur From : dd-mm-yyyy To : dd-mm-yyyy Submit

Jabalpur :- From 01-11-2020 00:00:00 To 01-11-2020 23:59:59

Show 100 entries

Copy CSV Excel PDF Print

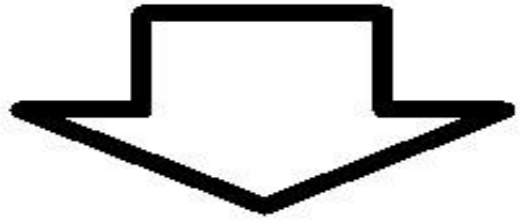
#	Date Time	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_X (ppb)	CO (mg/m^3)	SO_2 (µg/m^3)	NH
1	2020-11-01 00:00:00	DNR	DNR	DNR	DNR	DNR	
2	2020-11-01 00:15:00	274.00	116.00	21.60	0.47	7.00	
3	2020-11-01 00:30:00	274.00	116.00	24.80	0.52	5.60	
4	2020-11-01 00:45:00	274.00	116.00	28.50	0.56	4.90	
5	2020-11-01 01:00:00	241.00	106.00	34.70	0.57	3.90	
6	2020-11-01 01:15:00	241.00	106.00	32.60	0.58	3.60	
7	2020-11-01 01:30:00	241.00	106.00	30.30	0.44	4.00	
8	2020-11-01 01:45:00	241.00	106.00	28.40	0.39	3.60	
9	2020-11-01 02:00:00	205.00	111.00	22.50	0.18	3.50	
10	2020-11-01 02:15:00	205.00	111.00	16.20	0.13	3.00	
11	2020-11-01 02:30:00	205.00	111.00	16.90	DNY	2.70	
12	2020-11-01 02:45:00	205.00	111.00	17.10	0.58	2.40	
13	2020-11-01 03:00:00	153.00	90.00	15.80	0.58	2.20	
14	2020-11-01 03:15:00	153.00	90.00	12.80	0.58	2.30	
15	2020-11-01 03:30:00	153.00	90.00	12.10	0.57	2.30	
16	2020-11-01 03:45:00	153.00	90.00	13.80	0.55	2.70	

Drawn 24 hour average value of each pollutant

Station- Marhatal, Jabalpur - MPPCB (Row Data 15 Min Avg.)

From 01-11-2020 00:00:00 To 02-11-2020 00:00:00

#	Date Time	PM10	PM2.5	SO2	NOX	CO	NH3	Ozone
1	2020-11-01 00:15:00	274	116	7	22	0	23	29
2	2020-11-01 00:30:00	274	116	6	25	1	23	23
3	2020-11-01 00:45:00	274	116	5	29	1	23	13
4	2020-11-01 01:00:00	241	106	4	35	1	23	9
5	2020-11-01 01:15:00	241	106	4	33	1	23	16
6	2020-11-01 01:30:00	241	106	4	30	0	24	20
7	2020-11-01 01:45:00	241	106	4	28	0	24	16
8	2020-11-01 02:00:00	205	111	4	23	0	24	31



89	2020-11-01 22:15:00	508	212	9	132		32	3
90	2020-11-01 22:30:00	508	212	10	117	0	28	3
91	2020-11-01 22:45:00	508	212	10	90	1	29	3
92	2020-11-01 23:00:00	368	186	8	80	0	27	3
93	2020-11-01 23:15:00	368	186	6	67	0	24	2
94	2020-11-01 23:30:00	368	186	6	63	0	25	2
95	2020-11-01 23:45:00	368	186	6	51		27	7
96	2020-11-02 00:00:00	269	133		23		26	27
(24H) Row DATA Average »		**256**	**113**	**7**	**41**	**1**	**20**	**45**

Sub-index calculation using avg vlaue of each pollutant

Station- Marhatal, Jabalpur - MPPCB (Row Data 15 Min Avg.)

From 01-11-2020 00:00:00 To 02-11-2020 00:00:00

#	Date Time	PM10	PM2.5	SO2	NOX	CO	NH3	Ozone
(24H) Row DATA Average »		256	113	7	41	1	20	45

Calculation of AQI

Date		Station	NSIT
DD-MM-YYYY		City	Delhi
		State	Delhi

Pollutants		concentration in µg/m3 (except for CO)	Sub-Index	check
PM10	24-hr avg	256.00	206	1
PM2.5	24-hr avg	113.00	277	1
SO2	24-hr avg	7.00	9	1
NOx	24-hr avg	41.00	51	1
*CO (mg/m3)	max 8-hr	1.00	50	1
O3	max 8-hr	20.00	20	1
NH3	24-hr avg	45.00	11	1

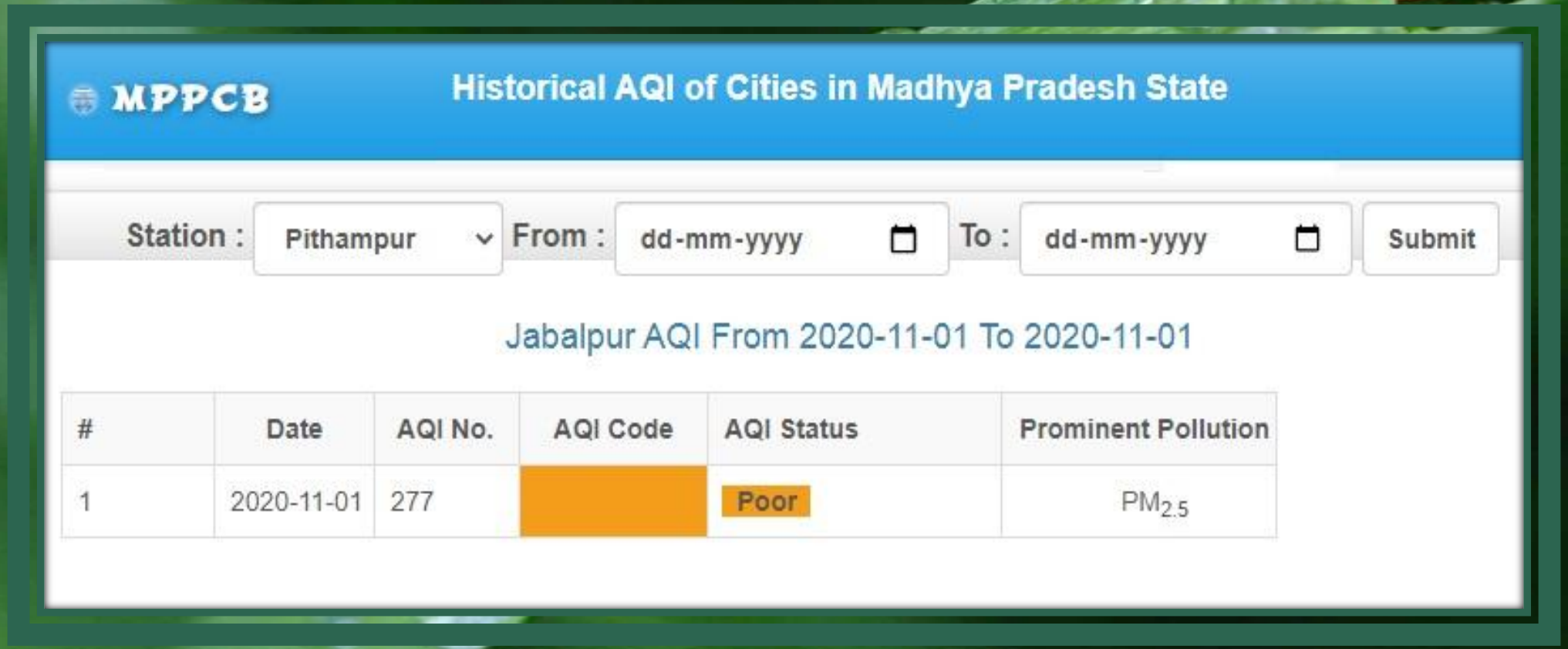
Air Quality Index

AQI = 277

* Concentrations of minimum three pollutants are required; one of them should be PM10 or PM2.5

* The check displays "1" when a non-zero value is entered

AQI publication on MPPCB website



MPPCB

Historical AQI of Cities in Madhya Pradesh State

Station : Pithampur | From : dd-mm-yyyy | To : dd-mm-yyyy | Submit

Jabalpur AQI From 2020-11-01 To 2020-11-01

#	Date	AQI No.	AQI Code	AQI Status	Prominent Pollution
1	2020-11-01	277		Poor	$PM_{2.5}$

मध्यप्रदेश प्रदूषण नियंत्रण बोर्ड
Madhya Pradesh Pollution Control Board

M.P. Pollution Control Board

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