

CHEMICAL PROCESS SAFETY COURSE

Organized by

Department of
Chemical Engg.
Gharda Institute
of Technology
Lavel



GIT | GHARDA
INSTITUTE OF
TECHNOLOGY

In Association with



GHARDA CHEMICALS LIMITED
High Performance Pigment Division

M/s GHARDA
CHEMICALS
LTD. LOTE



Under Guidance of
Directorate of
Industrial Safety
and Health

Course Duration

1 Year

Weekend Course

Saturday-Sunday

Starting Date

23rd October 2021

Contacts Us

Dr. S. P. Tekade
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www.git-india.edu.in

INVITATION

for Inception of

CHEMICAL PROCESS SAFETY COURSE

Organized by

Department of Chemical Engineering,
Gharda Institute of Technology Lavel

In Association



GHARDA CHEMICALS LIMITED
High Performance Pigment Division

**M/s GHARDA
CHEMICALS LTD. LOTE**



**Under Guidance of
Directorate of Industrial
Safety and Health**

Course Duration One Year (Weekend course)

Inauguration of Program

23nd Oct 2021 | at 10 am

Inauguration by

Shri. Sudhakar Rathod

Director, DISH Mumbai

In Presence of

Shri. Pradeep Bhintade

Dy. Director, DISH Ratnagiri

Shri. R. C. Kulkarni

Site Head
Gharda Chemicals Ltd.

In Presence of

Shri. Suresh Joshi

Joint Director, DISH Kolhapur

Brief introduction of program

Shri. Vijay Chandratre

Safety Expert

Dr. S. H. Gharat

Principal
Gharda Institute of Technology

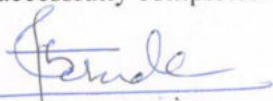
Gharda Institute of Technology
Department of Chemical Engineering

Report of Chemical Process Safety Course


The department of chemical engineering has organized a Chemical Process Safety Course in association with Gharda Chemicals Ltd (GCL) Lote and under guidance of Directorate of Industrial Safety and Health (DISH). The course is designed for industry professionals working in the chemical industries and engaged in chemical process safety. The duration of this course was one year, part time. The lectures were planned on every Saturday and Sunday from 10 AM to 4 PM. The course was inaugurated on 23rd October 2021 in presence of Mr. Sudhakar Rathod (Director, DISH Mumbai), Mr. Suresh Joshi (Joint Director, DISH Kolhapur), Mr. Pradeep Bhintade (Deputy Director, DISH Kolhapur), Mr. Vijay Chandratre (Safety Expert), Mr. R. C. Kulkarni (Site Head, GCL Lote) along with staff members of GIT. Total 33 number of participants from 18 various chemicals industries such as Gharda Chemicals Ltd, Vinati Organics Ltd, Excel Industries Ltd, Autchel Ltd, Laxmi Organics Ltd, Supriya Lifescience Ltd, Spak Surfactants Ltd, Thermax Ltd, Litmus Organics Pvt Ltd, etc. were registered for this course.

The various aspects of chemical process safety along with the practical/industrial applications of it have been imparted to the participants through this course. The syllabus of this course has been divided into the two parts i.e. chemical process safety (80%) and fundamentals of chemical engineering (20%). The experts engaged in covering chemical process safety parts were having very reach industrial experience. The other part of the syllabus has been covered by the various faculty members at chemical engineering department. The various experts were Mr. Vijay Chandratre (Ex Manager EHS Aarti Drugs), Mr. Tanaji Shinde (Manager EHS Aarti Drugs), Mr. Jayesh Mhatre (GM Deepak Fertilizers), Dr. S. S. Bhagwat (ICT Mumbai), Mr. Mayur Shinde (Aarti Drugs), and Mr. Suresh Joshi (Joint Director, DISH Kolhapur). The study tour of the participants was also organized to GVS Cibatech Pvt. Ltd. Mumbai on 22nd August 2022. The participants have practically studied the various important tests required for accessing and designing the safe chemical process.

At the end of the course the written exam (two papers 100 marks each) was conducted on 17th and 24th September 2022. The valedictory and certificate distribution of function of this course was organized on 18th November 2022. Total 27 numbers of participants have successfully completed the course.


Dr. Shyam Tekade
Coordinator & HOD




Dr. S. K. Patil
Principal




























Department of Chemical Engineering

Examination : Chemical Process Safety Course

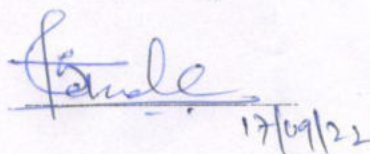
Date: 17-09-2022

Max Marks: 80

Subject:- Paper - 1

Sr. No	Name of Candidate	Signature of Candidate
✓ 1	MAHESH G. MORE	
✓ 2	TUSHAR M DEBE	
✓ 3	Mahendra Mulay	
✓ 4	Madhuri Shingam	
✓ 5	Nishit R. Shinde .	
6	Susmit M. Jadhav	
✓ 7	Shameer D. Chakare	
✓ 8	omkar S. Pandit	
✓ 9	Prasad E Tonadkar	
10	D. A. Pawar	
✓ 11	Sandip Nana Anhe	
✓ 12	Prasad. P. Kulkarni .	
✓ 13	Sameer S. Chougule .	
✓ 14	V. M. Pawar	
✓ 15	Shailesh R. Vedake .	
✓ 16	SALVE RAHUL PRABHAKAR	
✓ 17	Sanjay N. Thakur	
✓ 18	Mandar Surve	
✓ 19	Chavan Amit J.	
✓ 20	Sandeep D Parthi	
✓ 21	Prasanna V. Lad	
22	Mohsin. h. Banjar	
✓ 23	Sachin m. Soltar	
✓ 24	Satish Dhonde Pawar	
✓ 25	Subas Ulhas Berde .	
26	Prasad B. Mohite	
27	Paratik A. Yadav .	
28		
29		

Sign of Internal Examiner



Sign of External Examiner

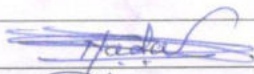
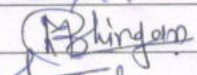


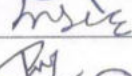

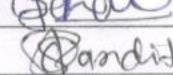
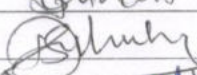
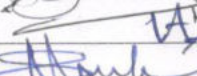
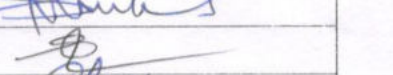
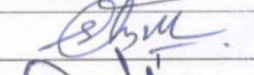



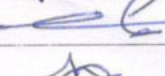

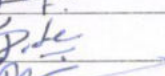

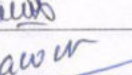
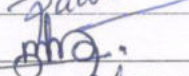
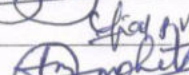
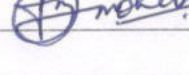
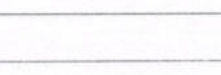


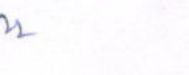

Department of Chemical Engineering

Examination : Chemical Process Safety Course

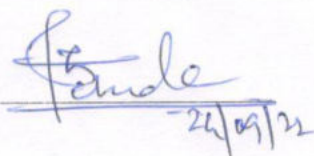
Date: 24-09-2022

Max Marks: 80

Subject:- Paper - 2

Sr. No	Name of Candidate	Signature of Candidate
1	Pratik Anant Yadav.	
2	Madhuri Ramchandra Shingam	
3	Nikhil Ramkrant Shinde	
4	MANOJ GANDAT MORE	
5	Sachin Madhakar Sutar	
6	Dilip Anandrao Pawar	
7	SUSHI MALUTI JADHAO	
8	Omkar Sunil Pandit	
9	Shameas D. Chavhan	
10	Keen M. Pawar	
11	Sandip Nana Ambre	
12	Sandesh D. Patil	
13	Dr. Sameer S. Chougale	
14	Mahendra G. Marap	
15	Salve Rahul Prabhakar	
16	Prasad Parashuram Kulkarni	
17	Prasad E. Tondkar	
18	Chavan Amit J.	
19	Sanjiv N. Thakre	
20	Mandar Nayan Surve	
21	Shailesh R. Vadake	
22	Tushar Debe	
23	Suhos Ulhas Barde	
24	Satish Dhondu Pawar	
25	Mohsin Husen Bangir	
26	Prasanna V. Lad	
27	Prasad B. Rokite	
28		
29		

Sign of Internal Examiner



Sign of External Examiner

Date: 17/09/2022

Total Marks: 80

Name of Candidate:

Note: Question 1 is **COMPULSORY**. Answer **ANY THREE** out of FIVE questions

Qu. I TICK the CORRECT ANSWER

(20 Marks)

1. What are the important terminology for identification the hazardous consequences in chemical process under HAZOP
 - a. Guide words
 - b. Possible Cause
 - c. Process Deviations
 - d. All of above

2. Process Parameters are
 - a. Physical parameters related to input/output material
 - b. Physical parameters related to input medium condition
 - c. Physical parameters related to system dynamics
 - d. All of the above

3. Fault Tree Analysis (FTA) is the technique
 - a. To accommodate the changes in process for increasing production
 - b. Focuses on one particular accident event and provides method for determining basic causes of that event
 - c. Used to identify combinations of equipment failures and human errors that can result in an accident or an initiating event
 - d. Both b and c

4. Static electricity is generated because of
 - a. Steady state contact of neutral similar metals for prolonged time
 - b. Unsteady state contact between dissimilar neutral metals
 - c. Contact between two dissimilar metals carrying opposite charges
 - d. Contact between two similar metals carrying same charges

5. Spark discharge has
 - a. Heterogeneous field
 - b. Homogeneous field
 - c. Mixed field
 - d. Non-uniform field

6. Under the ideal adiabatic conditions the value of thermal inertia is
- 0
 - 1
 - > 1
 - < 1
7. If the phi factor ϕ is 4 and measured adiabatic temperature rise is 100 C, in reality under true adiabatic conditions it would be
- 100 C
 - 200 C
 - 400 C
 - 50 C
8. Which part of ISO 4126 gives direction of Application and installation of safety devices excluding stand-alone bursting disc safety devices
- Part 1
 - Part 3
 - Part 7
 - Part 9
9. Match the equipment with respective evaluations
- Equipment
- Rotating equipment
 - Fire Equipment
 - Cooling Tower
 - Heat Exchanger
- Evaluation
- Look for changes in normal differential temperatures and pressures
 - Gas leaks, flames outside burner box
 - Unusual Vibrations
 - Look for uniform flow distribution
- I: P; II: Q; III: R; IV: S
 - I: R; II: Q; III: S; IV: P
 - I: Q; II: P; III: R; IV: S
 - I: P; II: Q; III: S; IV: R
10. The ideal batch reactor is where
- There is no input and output with time
 - There is only input and no output with time
 - There is continuous input and output
 - There is only output and no input

Qu II. Answer the following questions

(20 Marks)

- Define T_p , MTSR, T_{D24} and MTT
- Explain the concept of onset temperature
- Explain the strategies for feed control in case of semi batch reactor
- What is meant by the total hazard index? How is it calculated?

Qu III. Answer the following questions (20 Marks)

1. Classify the types of flow in emergency vent
2. Write a short note on selection of hoses during transfer of chargeable liquids
3. List the criteria of severity of desired reaction
4. Define Process Safety according to OSHA standard

Qu IV. Answer the following questions (20 Marks)

1. What are the steps in developing the safe process? Show Diagrammatically.
2. Explain the concept of evaporative cooling
3. Write the equation to calculate emergency relief vent sizing (Leung's method)
4. Define highly hazardous chemical and catastrophic release

Qu V. Answer the following questions (20 Marks)

1. Explain the application of lightning arrester
2. List the normal conditions and abnormal service conditions for lightning arrester
3. Draw the various symbols in the Fault Tree Analysis technique of identification of hazard
4. At which moment does the cooling failure have the worst consequences?

Qu VI. TICK the CORRECT ANSWER (20 Marks)

1. The measures to be taken during transfer of chargeable fluids through pipelines and hoses are:
 - a. The pipe (tube, hose) must be completely filled, if the formation of explosive mixtures within the pipe should be excluded.
 - b. Keep velocities low. For only partially filled pipes or pipes which discharge into containers, the velocity is to be limited as follows (irrespective of the pipe material)
 - c. Keep the liquids pure. Particles of dust or droplets of water are charge carriers.
 - d. All of above
2. Depending on the geometrical situation, on the materials involved and on certain other conditions different types of discharge are
 - a. Spark discharge
 - b. Brush discharge
 - c. Corona discharge
 - d. All of above
3. The measures to be taken while discharging solids that contain flammable liquids from stone filters (notches), centrifuges or other filtration apparatus are
 - a. Use effective local ventilation (e.g. suction hood) wherever possible
 - b. Use wooden shovels with wooden handles or earthed metal shovels.
 - c. The discharge chute on a centrifuge must be conductive and earthed.
 - d. All of the above

4. What is the main purpose of hazard identification
 - a. To minimize the effect of a consequence
 - b. For better risk management
 - c. To characterize adverse effect of toxins
 - d. To reduce probability of occurrence

5. Excessive pressurization by solvent vapor pressure and / or by the formation of incondensable gas caused by one of the following:
 - i. runaway reaction,
 - ii. abnormal heat input,
 - iii. fire around the reactor,
 - iv. a loss of cooling and stirring.
 - a. only i
 - b. only ii
 - c. only iii
 - d. All of the above (i to iv)

6. What is the role of Operator / User (Full-time attendee) in HAZOP team?
 - a. To manage the team meetings
 - b. Representing the team which has designed the process
 - c. Representing those who will operate the process
 - d. Providing specialist guidance to the team on maintainability issues

7. The origin of electrostatic charges in production plant are
 - A. A non- conductive solvent flows out of a metal pipe (separating effect). Liquid is charged, excess charges on the metal pipe flow down to earth.
 - B. Powder pours out of a plastic bag (separating effect). Powder and bag are charged, and also the dust cloud.
 - C. Transfer for non- conductive liquid or powder in glass or plastic pipe (separating effect in wall zone). Pipe and contents are charged, also the flanges.
 - D. Liquid is atomized through a metal nozzle (separating effect when droplets are formed). The droplets of liquid and the nozzle are charged.
 - a. Only A
 - b. A and B
 - c. C and D
 - d. All A to D

8. The meaning of guide word 'AS WELL AS' is
 - a. Complete negation of the design intent
 - b. Qualitative modification/increase
 - c. Logical opposite of the design intent
 - d. Complete substitution

9. The measures to be taken while handling powders with flammable gases/vapours are
- a. Closed handling of the product, under an inert atmosphere
 - b. Open handling of product under conductive environment
 - c. Closed handling of product under conductive conditions
 - d. All of the above
10. It is preferable to conductunder adiabatic conditions
- a. Highly endothermic reaction
 - b. Moderately endothermic reaction
 - c. Moderately exothermic reaction
 - d. Highly exothermic reaction

Date: 24/09/2022**Total Marks: 80****Name of Candidate:**

Note: Question 1 is **COMPULSORY**. Answer **ANY THREE** out of FIVE questions**Qu. I TICK the CORRECT ANSWER****(20 Marks)**

1. Static electricity is a (stationary)..... of electrical charge
 - a. surplus or deficit
 - b. absence
 - c. independent
 - d. none of these

2. Which of the following are necessary conditions for explosion
 - I. Oxidant
 - II. Mixing
 - III. Fuel
 - IV. Ignition source
 - V. Confinement
 - a. Only I, II and III
 - b. I to V
 - c. II, IV and V
 - d. None of these

3. The minimum spark energy needed to ignite an optimum concentration of the material using a capacitive spark under ideal conditions is called.....
 - a. Maximum ignition energy
 - b. Minimum explosion energy
 - c. Minimum ignition energy
 - d. Maximum spark energy

4. Adiabatic calorimetry is required when:
 - a. Continuous processing are used
 - b. Batch processing are used
 - c. Both
 - d. None of these

5. Major amendments in Factory Act 1948 were carried by addition of Chapter IV-A "Provisions related to Hazardous Process & three Schedules i.e.
- List of Industries Involving Hazardous Process
 - Permissible levels of Certain Chemical substances in work environment
 - List of Notifiable Diseases
 - All of the above
6. According to Safety act, Chapter IV, section 36, No person shall be required or allowed to enter any chamber, tank, vat, pit, pipe, flue or other confined space in any factory in which any gas, fume, vapour or dust is likely to be present to such an extent as to involve risk to persons being overcome thereby, unless it is provided with a manhole of adequate size or other effective means of egress
- No person
 - Every one
 - Designated person
 - Only shift incharge
7. Knowledge about critical interaction between the used chemicals and other material includes,
- Material resistance of reactor & other equipment
 - Possible material contact (e.g. media supply)
 - both a and b
 - Not mentioned
8. Every pressure plant in service shall be thoroughly examined by a competent person,-
- externally once in every period of months;
 - internally, once in every period of months, and
 - hydraulic test once in a period of.....years.
- 6, 24, 3
 - 6, 12, 4
 - 12, 6, 4
 - 4, 6, 12
9. According to EN 14 522, if the material is having Auto-ignition temperature range $> 135\text{ }^{\circ}\text{C}$ to $200\text{ }^{\circ}\text{C}$ is included in
- Temperature Class T4
 - Temperature Class T3
 - Temperature Class T2
 - Temperature Class T1

10. Thermogravimetric (TG) analysis is the additional test determining,

- a. Boiling point
- b. Melting point
- c. Flash Point
- d. Thermal Stability

Qu II. Answer the following questions

(20 Marks)

1. What is meant by lower flammability limit and upper flammability limit
2. What are various potential ignition sources (any five)
3. Which are the stages of dust explosion?
4. Write the minimum ignition energy for hydrogen, acetylene, carbon disulphide, sugar cloud, epoxy resin cloud

Qu III. Answer the following questions

(20 Marks)

1. Draw the flowchart of Strategy for assessing explosivity
2. Write a chain of events of accident model of FMEA
3. Write a general Event Tree Analysis (ETA) process
4. Write an equation to evaluate adiabatic rise in temperature

Qu IV. Answer the following questions

(20 Marks)

1. Write any five highly reactive substances with their molecular formula
2. Write the parameters/data required to assess the safe process
3. Draw the fire triangle
5. List the activities during powder handling which cause electrostatic charge generation

Qu V. Answer the following questions

(20 Marks)

1. What is meant by voltage?
2. Calculate the oxygen balance for TNT (Trinitrotoluene)
3. What is the heat of reaction?
4. Write the enthalpies of the reaction for Hydrogenation (nitroaromatic), combustion of hydrocarbons, Nitro decomposition, Amination and Nitration

Qu. VI TICK the CORRECT ANSWER

(20 Marks)

1. Ammonia synthesis is

 - a. Homogeneous non-catalytic reaction
 - b. Homogeneous catalytic reaction
 - c. Heterogeneous non-catalytic reaction
 - d. Heterogeneous catalytic reaction

2. Positive displacement pump uses the.....of a piston
 - a. Reciprocating action
 - b. Centrifugal action
 - c. Gyrometric action
 - d. Distinctive action
3. For gas absorption and stripping separation method the separating agent is
 - a. Heat
 - b. Membranes
 - c. Solvent
 - d. Drying gas
4. Azeotropic distillation is related with
 - a. separation of same boiling point mixture
 - b. separation of liquid mixture with the relative volatility close to 1
 - c. Both a and b
 - d. None of these
5. The steam distillation utilizes steam which will increase the of the components.
 - a. Boiling point
 - b. Vapour pressure
 - c. Flash point
 - d. Melting point
6. The function of pump is to convert
 - a. convert sound energy into mechanical energy
 - b. electrical energy into frictional energy
 - c. mechanical energy to hydraulic energy
 - d. mechanical energy to chemical energy
7. Molarity is defined as the
 - a. Moles of solute/Volume of solution
 - b. Volume of solute/Moles of solution
 - c. Moles of solute X Volume of solution
 - d. Moles of solute/Volume of Solvent

8. Process flow sheet includes

- a. Symbolic representation of hazard, safety precautions, etc.
- b. Flowrate or quantity of each stream, Heat added and removed in particular equipments
- c. Operating conditions such as temperature and pressure
- d. All of the above

9. NPSH is the.....required to make the liquid flow through suction pipe from sump to impeller

- a. Pick head
- b. Net head
- c. Gross head
- d. None of these

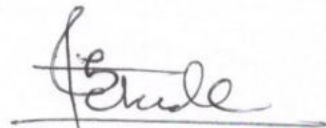
10. Removal of side stream is not possible in.....column

- a. Tray
- b. Packed

Max Marks: 80

Min Marks:32

Sr. No	Name Of Student	Marks		
		Paper 1	Paper 2	Average
1	Amit Chavhan	53	62	58
2	Arun Pawar	55	64	60
3	Dilip Pawar	40	52	46
4	Madhuri Shingan	43	60	52
5	Mahendra Malap	62	68	65
6	Mandar Surve	56	63	60
7	Manoj More	68	56	62
8	Mohsin Bargir	42	53	48
9	Nikhil Shinde	48	53	51
10	Omkar Pandit	51	61	56
11	Prasad Kulkarni	65	58	62
12	Prasad Mohite	42	62	52
13	Prasad Tondekar	56	62	59
14	Prasanna Lad	64	52	58
15	Pratik Yadav	66	60	63
16	Rahuk Salve	62	66	64
17	Sachin Sutar	56	58	57
18	Sameer Chaogule	62	56	59
19	Sandesh Parthe	62	52	57
20	Sandip Ambre	42	45	44
21	Sanjay Thakre	48	42	45
22	Satish Pawar	60	52	56
23	Shailesh Wadke	65	68	67
24	Shamrao Chakne	56	62	59
25	Suhas Berde	64	48	56
26	Sushil Jadhav	46	54	50
27	Tushar Debe	62	68	65



Name_Sign of Examiner S.P. Tekade

Feedback Form for Chemical Process Safety Course

Email *

debetushar@gmail.com

Full name of the participant *

Tushar Debe

Organization/Institute name *

Thermax Ltd

How was the course? *

- Much Better
- Slightly Better
- Slightly Worse
- Worse
- Other:

Please rate the organisation of this Course *

Not satisfied

- 1
- 2
- 3
- 4
- 5

Very Pleased

How useful to you was the information presented at the course? *

Not at all useful

1

2

3

4

5

Extremely Useful

What about the content of the course?

Poor

1

2

3

4

5

Exelent

The addition of new knowledge/skills gained by you through this course *

Low

1

2

3

4

5

High

What about the duration (one year part time) of this course? *

- Just Perfect
- Too much Long
- Too much Short

Quality of speakers at the course *

Worse

- 1
- 2
- 3
- 4
- 5

Very Good

Will you suggest this course to your colleague/friend/company? *

- Yes
- No
- Maybe

What did you like about the course?

Theory which can be practically applied

Please write the two best sessions/resource persons at the course according to you

Vijay Chandratre, Mayur Shinde

Overall how would you rate the course? *

- Excellent
- Very good
- Good
- Poor
- Fair

Anything you would like to share about the improvement of FDP ?

Performing HAZOP with students same as the problems are solved.. Taking more practical group activities like HAZOP, HAZID

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Feedback Form for Chemical Process Safety Course

Email *

pratikanantyadav@gmail.com

Full name of the participant *

Pratik Anant Yadav

Organization/Institute name *

Gharda Institute of Technology

How was the course? *

- Much Better
- Slightly Better
- Slightly Worse
- Worse
- Other:

Please rate the organisation of this Course *

Not satisfied

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- 2
- 3
- 4
- 5

Very Good

Will you suggest this course to your colleague/friend/company? *

- Yes
- No
- Maybe

What did you like about the course?

Hole management through organization

Please write the two best sessions/resource persons at the course according to you

Static electricity and Runaway Reaction

Overall how would you rate the course? *

- Excellent
- Very good
- Good
- Poor
- Fair

Anything you would like to share about the improvement of FDP ?

Required more concentrate on problems

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Google Forms



CERTIFICATE

OF COMPLETION

This Certificate is Presented To

Sushil Jadhav

For successfully completing the **Chemical Process Safety Course 2022** conducted by **Gharda Institute of Technology Level** in association with **Gharda Chemicals Ltd. Lote** under the guidance of **Directorate of Industrial Safety and Health**

DR. S P TEKADE
COORDINATOR
GIT LEVEL

DR. S K PATIL
PRINCIPAL
GIT LEVEL

MR. R C KULKARNI
SITE HEAD
GCL LOTE



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Prasad Mohite

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PRINCIPAL
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SITE HEAD
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