

TCE.M6-EL-AM-xxx	TATA CONSULTING ENGINEERS LIMITED	SECTION: TITLE
	USER MANUAL FOR AiSLDPro	SHEET i OF iii

USER MANUAL FOR
AiSLDPro
VERSION 1.0

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	USER MANUAL FOR ELECTRICAL DESIGN SUITE (EDS) DIESEL GENERATOR DIMENSIONING	SHEET ii OF iii

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1. Overview

1.1 Purpose of Document

This document serves as a comprehensive roadmap, guiding users through the tool with clarity and confidence. It highlights key features and navigation paths, ensuring users gain a deep understanding of the site's capabilities. With step-by-step instructions it empowers users to unlock the full potential of the tool, enabling them to achieve their goals with ease and precision.

1.2. Scope of this Document

This document offers detailed explanations of key features, navigation flows, and user interfaces, giving users a clear view of how to interact with the platform. It also highlights any limitations or constraints users might face, ensuring transparency and preparedness. Overall, the document is designed to provide a thorough understanding of the tool, empowering users to efficiently create, manage, and optimize their SLD Drawings.

2. Project Description

A Single Line Diagram (SLD) is an essential element of the electrical power system in plants, industries, and buildings. It visually represents the power supply arrangements, distribution networks, and connection topology between substations to loads. One of its key components, the Protection SLDs, is traditionally developed across various business units in all projects using AutoCAD. However, this manual process is often time-consuming, repetitive due to frequent revisions, and prone to errors.

The AI-enabled SLD tool – AiSLDPro revolutionizes this process by offering an interactive solution to automatically generate Protection SLDs with minimal user input. By processing the provided data, the tool generates SLDs directly for AutoCAD without requiring a software license, ensuring efficiency, accuracy, and significant time savings.

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3. Web Solution

The AiSLDPro web solution is a secure, high-availability portal, designed exclusively for internal use within TCE. The left-hand navigation panel features five distinct links, each directing users to a specific section of the platform. Below is a detailed breakdown of each page and its purpose within the system.

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4. Projects

This is the 1st step for creating any SLD. The Project Page is where user will create a new project in the system, this project is referred to a Project for which these drawings are generated. Here you can see various projects which user have already created.

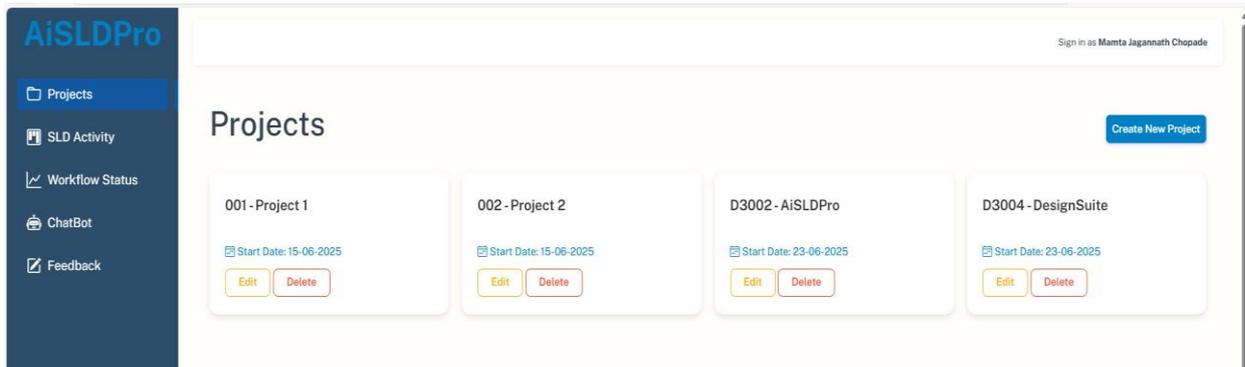
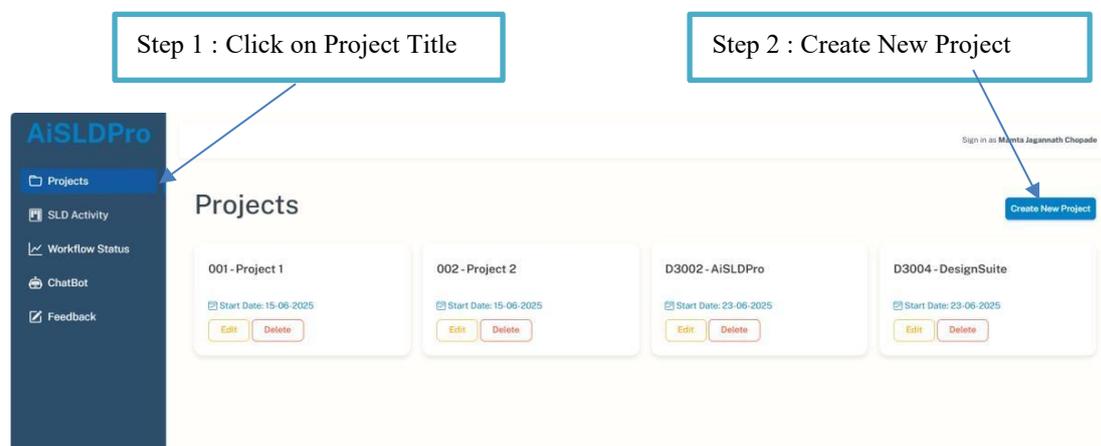


Fig. 3.1 Project Page

4.1 Create Project

In the Create Project, user fill the necessary information to create project like Job No, project name. All the drawings belong to one project will be grouped in single cluster, and hence easier to manage, access and generate and keep track of progress.



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Step 3 : Insert All project Details

4.2 Edit Project

Step 1 : To Update Data in Project
Click on Update Button

Step 2 : Update Data and submit

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4.3 Delete Project

The screenshot shows the 'Projects' page in AiSLDPro. On the left is a navigation menu with 'Projects' selected. The main area displays a list of four projects: '001 - Project 1', '002 - Project 2', 'D3002 - AiSLDPro', and 'D3004 - DesignSuite'. Each project card includes a start date and 'Edit' and 'Delete' buttons. A blue callout box with an arrow pointing to the 'Delete' button of '001 - Project 1' contains the text: 'Step 1 : To Delete Project Click on Delete Button'.

5. SLD Activity

After creating the project, next step is to create an activity. In each project, each SLD will be considered as an activity.

5.1 Create Activity

The screenshot shows the 'Activity Details' page in AiSLDPro. The left navigation menu has 'SLD Activity' selected. The main area contains a form for creating an activity with fields for 'Project' (a dropdown menu) and 'SLD Name' (a text input). A 'Create New' button is located in the top right corner. Two callout boxes are present: 'Step 1 : Click on SLD Activity' with an arrow pointing to the 'SLD Activity' menu item, and 'Step 2 : Click on Create New' with an arrow pointing to the 'Create New' button. Below the form is a table titled 'Generated Activities' with columns for 'SLD NAME', 'DESCRIPTION', and 'ACTIONS'.

SLD NAME	DESCRIPTION	ACTIONS
Activity 123	Testing Indian Project with Activity 123	[Edit] [Delete]
Activity 123 edited	Testing Indian activity with Activity 123 edited	[Edit] [Delete]

Step 3 : Fill All Activity Details which are required to create new SLD

Step 4 : Click on General Details

Step 5: Fill All General Details (like Project Type, Switchgear Designation, etc)

Step 7: Click on Default Setting

Step 6: CBCT, Earth switch, CVD and 87 B shall be selected based on the project requirements. If Earth switch is selected, CVD is automatically selected.

Step 8: These are the standard default values used in sizing of various equipment such as CB, Bus bar, CT and for protection selection. If any changes required as per specific project requirement, User may do it.

Step 9: Click on SLD Configuration

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Step 10: Click on Any SLD Configuration as per the switchgear requirement i.e. no. of incomer and Bus coupler. Ensure that the clicked image is highlighted.

SLD Configuration

Please Click on Image to Select Desired SLD Configuration.

Busbar Details

No of Bus : 1

Bus VT to Be Added?
 Yes No

BUS	KKS CODE (OPTIONAL)	DESIGNATION	VOLTAGE (kV)	RATING (A)	CONDUCTOR MATERIAL	FREQUENCY	SC RATING (kA)	SC TIME (sec)
1		Bus-A	11		Al	50	40	1 sec

Bus Voltage Transformer

KKS Code (Optional)

Open Delta required in one of the winding?
 Yes No

Ratio(kV/V)

59N (Voltage based E/f protection) Ferroresonance damping

Note: You can change the VT Ratio by modifying the Switchgear Voltage in the General Details and the PT Secondary Voltage (V) in the Default Settings.

Step 11: KKS Code is optional based on Project requirement, same can be filled. Open delta shall be selected for two reasons.
 i) Voltage based earth fault protection. This is given only when the system is ungrounded.
 ii) Ferro resonance damping of VT

Step 12: Fill all Details in Incomer as per requirement. In case of 3 winding transformers please read the notes below before filling the capacity.

Incomer Details

No of Incomer : 1

INCOMER	CONNECTED BUS	KKS CODE (OPTIONAL)	DESIGNATION	TERMINATION	CAPACITY (MVA)	TYPE	Z (%)	CABLE SIZE	CABLE CONDUCTOR
1	1			Select	Enter cap	Select			

Note: For 3 winding transformer (with two secondary windings) please enter the capacity in MVA of the respective secondary winding which is connected to this switchgear For Eg if rating is 65/35/44 MVA and voltage ratio is 220/33/11kV , If this SLD is for 11kV then enter the capacity as 44.

Equipment For Incomer 1

Protection and Metering

Step 13: Click on Equipment for Incomer

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Note: Incomer Equipment's Details Tab should be shows as per incomer type selection.

Step 14: Fill all Details in KKS Code Tab if Required.

Step 15: Click on Line Voltage Transformer Tab

Step 17: Click Incomer Transformer Tab and fill all the mandatory details * marked.

Step 16: Select No of secondary winding as per requirement.

Step 19: Click NGR Tab Tab and fill all the mandatory details * marked.

Winding	Winding Vector *	Voltage (kV) *	Neutral Earthing	Earth Fault Limiting Current (A) *
Primary Winding	Select			
Secondary Winding 1	Select			

Step 18: Fill All Details as per requirement.

Step 20: Fill All Details as per requirement.

Equipment For Incomer 1

KKS Code (Optional) Line Voltage Transformer Incomer Transformer **NGR**

Earth Fault Limiting Current (A)* Time (Sec)

Step 21: check for NGR or NGT/NGR and Fill All Details as per requirement. This will be applicable for only Generator Incomer.

Equipment For Incomer 1

KKS Code (Optional) Line Voltage Transformer Generator **NGT/NGR**

NGT/NGR NGR

Rating(kVA) Voltage Ratio(kV/V)

Resistor Value(Ω) NGR Current(A)* Time(Sec)*

Protection and Metering

Step 22: Click on Protection and Metering Panel

Step 23: Default protection and metering as per the selected incomer type. If any additions required User may select after ensuring the requirement Incomer type.

Protection and Metering

Incomer from Generator (Directly connected Generator without GT)

87G 51GDL 51V 32 40 46 27 59 60 64G1 64G2 78G 81U 81O 50LBB 86 95 87B

AVR CT1-CORE-1 Other

TVM LM PQ MFM A ASS-A V VSS-V Other

Outgoing Details

Upload Excel Template Excel

Step 25: After filled all the details in the template Upload Filled excel sheet.

Step 24: Click on Template excel To Download Excel Template for uploading Outgoing Details.

After Uploading Excel, it will look like this.

Outgoing Details

KKS CODE	CONNECTED BUS	DESIGNATION	TYPE	MOTOR FEEDER TYPE	CAPACITY	UNIT (KW/KVA)	POWER FACTOR	EFFICIENCY	TERMINATION TYPE	BUS DUCT RATING(A)	LINE VT TO BE ADDED ?
2	1	UNIT SERVICE TRANSFORMER	Service/Distribution Transf	VCB	3000	kVA	0.8	0.95	Cables		No
3	1	UNIT SERVICE TRANSFORMER	Service/Distribution Transf	VCB	1500	kVA	0.8	0.95	Cables		No
4	1	Motor (11-12BFT)	Motor	Vaccum Contactor	2000	kW	0.8	0.95	Cables		No
5	1	To Switchgear (11-12BFT)	To Switchgear	VCB	2500	kVA	0.8	0.95	SPBD	2000	Yes
6	1	SFC (11-12BFT)	SFC	VCB	3000	kVA	0.8	0.95	Cables		No
7	1	Power Transformer	Power Transformer	VCB	5000	kVA	0.8	0.95	Cables		No
8	2	To Switchgear (11-12BFT)	To Switchgear	VCB	1000	kVA	0.8	0.95	SPBD	2500	Yes
9	2	Capacitor/SVG	Capacitor/SVG	VCB	2000	kVA	0.8	0.95	Cables		No
10	2	Motor (11-12BFT)	Motor	Vaccum Contactor	2500	kW	0.8	0.95	Cables		No
11	2	VFD/VFD Transformer	VFD/VFD Transformer	VCB	4200	kVA	0.8	0.95	Cables		No
13	2	Motor (11-12BFT)	Motor	VCB	800	kW	0.8	0.95	Cables		No
12	2	Power Transformer	Power Transformer	VCB	2000	kVA	0.8	0.95	Cables		No

Showing 1 to 13 of 13 entries

Step 26: Based on the outgoing excel template uploaded, Equipment tabs for unique outgoing feeder types will be displayed, click each tab, and fill all the mandate values.

Step 27: Fill All Details as per requirement.

Power Transformer Details

Outgoing - Power Transformer

Rating (kVA) 2000	Voltage Ratio(kV) 11kV/21kV	Cooling ONAN	Tap Changer OCTC
Tap Range * +/-5%	Steps (%) 2.5	Vector Group Dyn11	Impedance Z1 (%) * 12

WINDING	WINDING VECTOR *	NEUTRAL EARTHING	EARTH FAULT LIMITING CURRENT (A)	VOLTAGE (KV) *
Primary Winding	Delta			11
Secondary Winding 1	Star	Resistance	12	21

Service/Distribution Transformer-Oil Type Details

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Step 28: Fill All Details as per requirement.

Service/Distribution Transformer - Oil Type Details

Outgoing Distribution Transformer

Type: Oil
Rating (kVA): 3000
Voltage Ratio(kV): 11kV/23kV
Cooling: ONAN

Vector group: Dyn11
Impedance Z1 (%): 12

WINDING	WINDING VECTOR *	NEUTRAL EARTHING	EARTH FAULT LIMITING CURRENT (A)	VOLTAGE (KV) *
Primary Winding	Delta			11
Secondary Winding	Star	Solidly		23

Service/Distribution Transformer - Dry Type Details

Step 29: Fill All Details as per requirement.

Service/Distribution Transformer - Dry Type Details

Outgoing Distribution Transformer

Type: Dry
Rating (kVA): 1500
Voltage Ratio(kV): 11kV/21kV
Cooling: AN

Vector group: Dy11
Impedance Z1 (%): 12

WINDING	WINDING VECTOR *	NEUTRAL EARTHING	EARTH FAULT LIMITING CURRENT (A)	VOLTAGE (KV) *
Primary Winding	Delta			11
Secondary Winding	Star	Resistance	12	21

Power Transformer Details

Protection and Metering

Step 30: Click the 'Protection and Metering' section to expand for each type. All required protections are auto selected. If any addition is required further, same may be selected,

You can select and check all the protection and metering options as shown below. Some options can be selected based on your requirements, while others are automatically filled based on predefined conditions.

Protection and Metering

Meterings For Outgoing

MFM
 LM
 PQ
 A
 ASS-A

• Metering selected here will apply to all outgoing feeders except Motor

Power Transformer

50
 50N
 51
 51N
 50G
 50LBB
 80
 95
 87T
 64R-HV
 64R-LV
 87B
 51NS-LV
 51NS-HV

• Notes: 1) 50N/51N will be automatically selected for each power transformer based on the primary vector
 • 2) 87T, 64R-HV, 64R-LV will be considered appropriately for Transformer rating 5MVA and above. For any variations, You may change in Default Settings

VFD/VFD Transformer

50
 50N
 50G
 51
 51N
 50LBB
 80
 95
 87B

Service/Distribution Transformer - Oil Type

50
 50N
 51
 51N
 50G
 50LBB
 80
 95
 87B
 64R
 51NS

• Notes: 50N/51N will be automatically selected for each Distribution transformer based on the primary vector

Service/Distribution Transformer - Dry Type

50
 50N
 50G
 51
 51N
 50LBB
 80
 95
 87B
 64R
 51NS

• Notes: 50N/51N will be automatically selected for each Distribution transformer based on the primary vector

Motor

87M
 80M
 50LBB
 50G
 80
 95
 87B

LM
 PQ
 MFM
 A
 ASS-A

• Notes: 87M will be considered appropriately for Motors rating >=1MW. For any variations, You may change in Default Settings

To Switchgear

51
 51N
 67
 67N
 25
 50LBB
 80
 95
 67C
 87B

SFC

50
 50N
 50G
 51
 51N
 50LBB
 80
 95
 87B

Capacitor/SVG

50
 50N
 50G
 51
 51N
 50LBB
 80
 95
 87B

Notes

Step 31: Click the 'Notes' section to expand.

Step 32: Click the 'Engineering Reference Drawing' tab to open it.

The screenshot shows a 'Notes' window with three tabs: 'Notes', 'Engineering Reference Drawing', and 'Title'. The 'Engineering Reference Drawing' tab is active. Below the tabs is a table with a blue header 'NOTES' and 9 rows of text. At the bottom left of the table are two buttons: 'Add Row' (yellow) and 'Remove Row' (red).

NOTES	
1	All CT and VT parameters shown are indicative only. Exact parameters shall be finalised during detailed engineering
2	All numerical relays shall have IEC 61850 protocol and MFM shall have modbus RTU protocol
3	CT for motor differential at motor end shall be supplied by Motor Vendor
4	Accuracy class of MFM/PQ/LM shall be 0.5
5	All MCBs shall have auxiliary contacts for annunciation and blocking voltage dependant protection
6	All cable sizes indicated are tentative only
7	Transformer Voltage ratio indicated is for No load condition
8	EQUIPMENT NUMBERING IS FOLLOWED AS PER KKS CODING PROCEDURE
9	STAND BY E/F PROTECTION (SINS) FOR TRANSFORMER NEUTRAL SHALL BE PART OF HV SIDE RELAY

Step 33: To add a new note, click the 'Add Row' button and enter the note.

Step 34: If you want to delete a newly added note, click the 'Delete Row' button.

Step 35: Click on Title Tab

Step 36: Fill all details as per requirement.

The screenshot shows the 'Notes' window with the 'Title' tab selected. The table header is 'ENGINEERING REFERENCE DRAWING'. It contains two rows of text. The 'Add Row' and 'Remove Row' buttons are visible at the bottom left.

ENGINEERING REFERENCE DRAWING	
1	Engineering Reference Drawing 1
2	Engineering Reference Drawing 2

Step 37: To add a new Engineering Reference Drawing, click the 'Add Row' button and enter the note.

Step 38: If you want to delete a newly added Engineering Reference Drawing, click the 'Delete Row' button.

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Step 39: Fill all details as per requirement.

Notes

Notes Engineering Reference Drawing Title

Project Name: Client Name: File Name*: Drawing Name*:

Drawing No*: Issue No*:

Drawn By (DRN)*: PE/PM*:

Design By (DSN)*: Approved By*:

Checked By (CHD)*: Date*:

Cleared By (EL)*:

DXF Generation

Generate SLD

Step 40: Click the **Generate SLD** button to create the SLD. Make sure all mandatory fields are completed beforehand. Once generated, you can update the status in the activity workflow.

5.2 Edit Activity

Click the Edit button to modify the input data, then generate the SLD. Ensure that after editing the current activity, you do not navigate back to the previous activity.

Activity Details Create New

Project: SLD Name: Start Date: End Date:

🔍 🔍

Generated Activities

ACTIVITY NAME	DESCRIPTION	ACTIONS
MV switchgear		✎ ✖
MV switchgear		✎ ✖

1

Step 1: To Edit Project, Click on Edit

5.3 Delete Activity

Step 1: To Delete Project, Click on Delete Button

6. Workflow Status

The generated SLD status can be viewed in this section.

Step 1: Click on Workflow status to view status of the generated SLD. It may take 4-5 minutes to generate a SLD

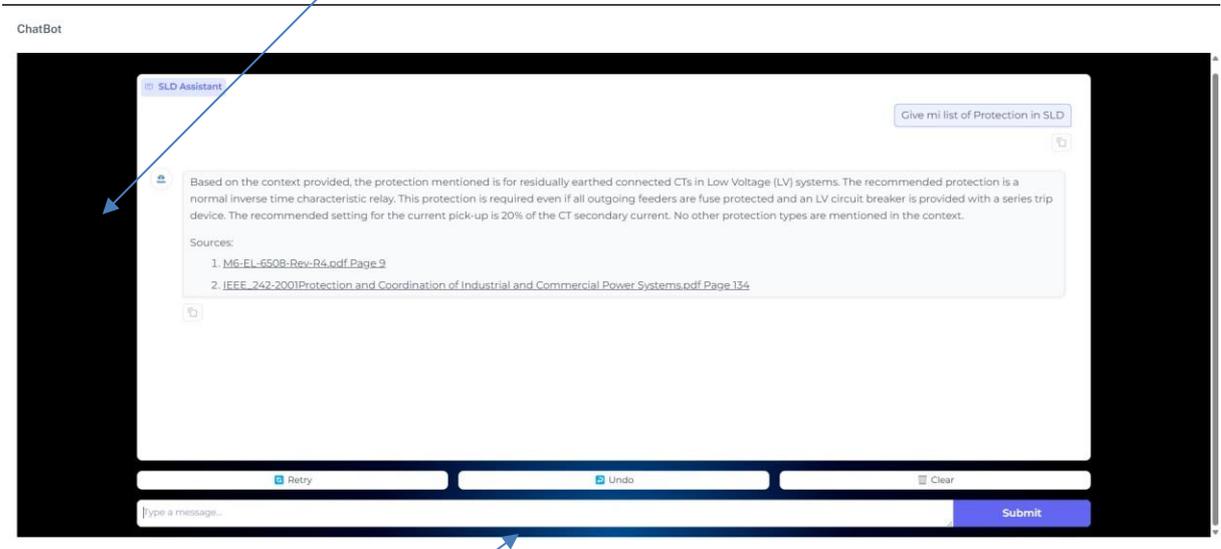
Step 2: Click on Download Icon to Download the generated SLD.

7. Chatbot

The Chatbot is internal AI support. If any queries same may be submitted. The queries will be answered by referring the TCE design guides pertaining to Protection SLD, Codes and standards.

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Step 1: Click on ChatBot to raise queries.

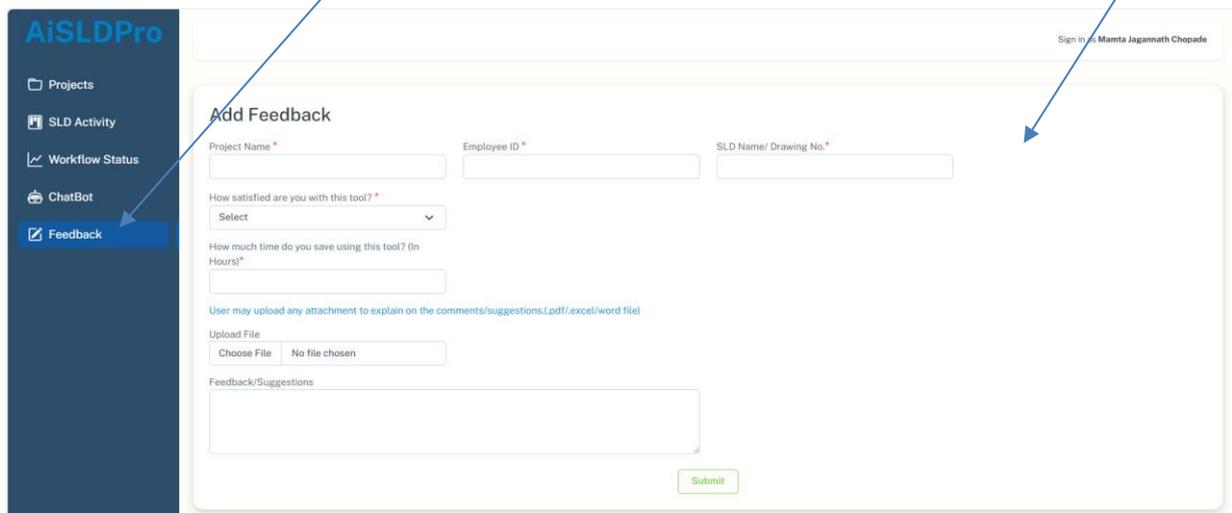


Step 2: Write the query and submit to find solution.

8. Feedback

Step 1: Click on Feedback

Step 2: Fill Feedback Form and submit.



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