Below is a proposed software specification with a set of API functions designed to cover the various report‐ and list–generation tasks in the semiconductor chip test data analytics domain. In this specification, most instructions (e.g., “Compile Analysis Report”, “Document Findings”, “Reporting”, “Generate Report”) are handled by a generic report–compilation function, while the few instructions that require assembling a table or list are handled by dedicated functions.

**Function 1: compile\_report**

**Function Name**: compile\_report  
**ID**: Supports multiple IDs – for example: 1\_8, 3\_7, 13\_7, 21\_8, 25\_8, 37\_9, 46\_8, 59\_9, 67\_10, 78\_9, 2\_10, 16\_9, 39\_7, 73\_7, 4\_7, 15\_8, 17\_8, 29\_8, 58\_8, 12\_9, 53\_7, 68\_9, 5\_7, 1\_11, 3\_10, 14\_9, 18\_7, 26\_6, 27\_8, 30\_8, 37\_8, 9\_7, 10\_9, 38\_5, 35\_5, 6\_7, 16\_10, 33\_10  
**Purpose**:  
To generate a comprehensive report by compiling various sections (such as findings, methodology, statistical results, visualizations, and recommendations) based on the analysis of semiconductor test data. This function is intended to be flexible so that it can serve multiple reporting requirements—from detailed analysis reports to summary reports.

**Signature**:

def compile\_report(workflow\_id: int,

instruction\_id: int,

title: str,

sections: dict,

report\_type: str = "detailed") -> "Report":

"""

Compiles a report based on provided analysis sections and the specified report type.

Parameters:

workflow\_id (int): The identifier for the workflow.

instruction\_id (int): The identifier for the instruction.

title (str): The title of the report.

sections (dict): A dictionary containing various sections of the report.

Expected keys may include 'findings', 'methodology',

'statistics', 'visualizations', 'recommendations', etc.

report\_type (str): The type of report to generate (e.g., "summary", "detailed",

"analysis", "documentation"). Defaults to "detailed".

Returns:

Report: A structured report object containing the compiled content.

"""

pass # Implementation goes here

**Used For**:  
This function is used to support instructions that require the generation of reports, including but not limited to:

* **Workflow 1, Instruction 8** – Compile Analysis Report with visualizations, statistical results, and interpretation.
* **Workflow 3, Instruction 7** – Compile Report summarizing correlations, methodology, and recommendations.
* **Workflow 13, Instruction 7** – Compile Analysis Report with statistics, visualizations, and recommendations.
* **Workflow 21, Instruction 8** – Compile and Report analysis detailing correlation statistics and recommendations for process shifts.
* **Workflow 25, Instruction 8** – Compile Analysis Report detailing wafer map patterns and correlations with probe card IDs/test programs.
* **Workflow 37, Instruction 9** – Compile Report documenting mechanical misalignment issues and recommendations.
* **Workflow 46, Instruction 8** – Compile and Report Results including correlation strength and insights across test houses.
* **Workflow 59, Instruction 9** – Compile Report summarizing methodology, analysis, correlations, and actionable insights.
* **Workflow 67, Instruction 10** – Compile Report detailing methodology, correlation statistics, and recommendations.
* **Workflow 78, Instruction 9** – Compile Findings in a Report based on statistical analysis.
* **Workflow 2, Instruction 10** – Report Findings and Recommendations summarizing equipment chain relationships and diagnostics.
* **Workflow 16, Instruction 9** – Report Findings summarizing correlation results, key subgroups, and yield issues.
* **Workflow 39, Instruction 7** – Report Findings detailing yield comparisons with numerical results and visualizations.
* **Workflow 73, Instruction 7** – Report Findings listing wafers with below-target yields and die failure clusters.
* **Workflow 4, Instruction 7** – Document Findings with data analysis and identified trends.
* **Workflow 15, Instruction 8** – Document Findings for yield performance differences.
* **Workflow 17, Instruction 8** – Document/Compile Report detailing the impact of probe configuration changes.
* **Workflow 29, Instruction 8** – Document Findings summarizing high variance measurements and their impact on yield differences.
* **Workflow 58, Instruction 8** – Document and Visualize Findings with wafer maps, correlation plots, and recommendations.
* **Workflow 12, Instruction 9** – Reporting of analysis including yield criteria and statistical results.
* **Workflow 53, Instruction 7** – Reporting a comprehensive report with insights and trends.
* **Workflow 68, Instruction 9** – Reporting a comprehensive report summarizing correlation findings and corrective actions.
* **Workflow 5, Instruction 7** – Summarize Insights regarding yield performance differences.
* **Workflow 1, Instruction 11** – Analysis Reporting of lot yield drops, wafer map patterns, and actionable insights.
* **Workflow 3, Instruction 10** – Reporting a report with additional inspection recommendations and actionable insights.
* **Workflow 14, Instruction 9** – Compile and Report Results comparing test yields and underlying causes.
* **Workflow 18, Instruction 7** – Compile and Report Findings on analysis process and observed correlations.
* **Workflow 26, Instruction 6** – Compile and Report Analysis outlining correlations and yield improvement implications.
* **Workflow 27, Instruction 8** – Compile Report summarizing methodology, analysis, findings, and recommendations for yield improvement.
* **Workflow 30, Instruction 8** – Compile Findings and Report detailing statistical measures and the impact of E-test variation.
* **Workflow 37, Instruction 8** – Compile and Report Findings on repeating patterns among failing wafers.
* **Workflow 9, Instruction 7** – Generate a Summary Report comparing parametric versus logical test failures.
* **Workflow 10, Instruction 9** – Generate Report with methodology, findings, and hardware debug recommendations.
* **Workflow 38, Instruction 5** – Generate Summary Report for top three test bins with failure counts.
* **Workflow 35, Instruction 5** – Report Results listing wafers, soft bin(s), and failure percentages.
* **Workflow 6, Instruction 7** – Summarize Findings indicating prevalent soft bins and yield loss origin.
* **Workflow 16, Instruction 10** – Reporting a comprehensive report summarizing yield trends and fab process changes.
* **Workflow 33, Instruction 10** – Document Findings linking load board configurations with lower yields.

**Function 2: create\_pass\_fail\_status\_list**

**Function Name**: create\_pass\_fail\_status\_list  
**ID**: 8\_5 (Workflow 8, Instruction 5)  
**Purpose**:  
To generate a list or table that displays each test program alongside its determined pass/fail status for a specific wafer. This function is focused on aggregating status information in a structured format.

**Signature**:

def create\_pass\_fail\_status\_list(wafer\_id: str,

test\_programs: list,

statuses: list) -> list:

"""

Creates a list (or table) displaying each test program and its corresponding pass/fail status.

Parameters:

wafer\_id (str): The identifier of the wafer.

test\_programs (list): A list of test program names.

statuses (list): A list of boolean values (or status indicators) corresponding to each test program

(e.g., True for pass, False for fail).

Returns:

list: A list of dictionaries, each containing a test program name and its pass/fail status.

"""

pass # Implementation goes here

**Used For**:

* **Workflow 8, Instruction 5** – Compile Pass/Fail Status: Create a list or table displaying each test program alongside its determined pass/fail status.

**Function 3: compile\_and\_list\_results**

**Function Name**: compile\_and\_list\_results  
**ID**: 21\_5 (Workflow 21, Instruction 5)  
**Purpose**:  
To gather and compile identifiers for wafers that meet a specific pattern criterion (for example, wafers exhibiting an edge‐ring failure pattern). This function aggregates filtered wafer IDs into a final list for further review or processing.

**Signature**:

def compile\_and\_list\_results(criteria: dict) -> list:

"""

Compiles and returns a list of wafer identifiers based on specified criteria.

Parameters:

criteria (dict): A dictionary containing the filtering criteria (e.g., pattern criteria,

yield thresholds, etc.).

Returns:

list: A list of wafer identifiers that meet the criteria.

"""

pass # Implementation goes here

**Used For**:

* **Workflow 21, Instruction 5** – Compile and List Results: Gather the identifiers for all wafers meeting the specified pattern criteria and produce a final list.

This specification outlines three main API functions. The generic compile\_report function is designed to serve the bulk of the reporting needs (covering most “compile”, “document”, “report”, and “generate” instructions), while the dedicated functions create\_pass\_fail\_status\_list and compile\_and\_list\_results address list/table generation tasks.

Feel free to adjust parameter names or extend the functions further based on evolving requirements or additional analysis details.