

IPMDAR Schedule Performance Dataset

Version 1.0

File Format Specification

March 12, 2020

1	Overview	2
2	Data Model	2
2.1	Data Model Conventions	2
2.2	Tables	4
2.3	Primitive Data Types	16
2.4	Enumerations	16
3	File Format	20
3.1	File Conventions.....	20
3.2	File Contents	20
3.3	File Type/Version	20
4	Representation in JSON	21
4.1	JSON Conventions	21
4.2	JSON Schema Sample.....	21
4.3	JSON Data Sample.....	22
5	References	22

1 Overview

This document is intended as a technical reference for computer programmers implementing software to support the exchange of data composing the IPMDAR Schedule Performance Dataset.

2 Data Model

Data in an IPMDAR Schedule Performance Dataset are modeled as a collection of tables related by primary and foreign key constraints.

2.1 Data Model Conventions

2.1.1 Tables

A table has a collection of fields and a collection of records. Each field has a name and a primitive data type. Each record has a collection of field values. Each field value must be consistent with the data type of the corresponding field. Records have an implicit sequence.

2.1.2 Nullable Fields

Records may omit values for fields that are nullable but must include values for fields that are not nullable. Unless otherwise noted, omitted field values may be interpreted as null, undefined, or “not applicable”. All of these interpretations are considered equivalent.

2.1.3 Key Constraints

A primary key constraint defines a collection of fields for a table such that the corresponding field values uniquely identify each record. No two records may have the same collection of corresponding field values.

A foreign key constraint defines a correspondence between a field in one table and a field in another table such that the field value for each record in the former must match the field value for some record in the latter.

2.1.4 Enumerations

Enumerations are implicit lookup tables available for use with foreign key constraints.

2.1.5 Singletons

Singletons are tables with exactly one record.

2.1.6 Strings

Strings are sequences of text characters defined by the Unicode standard.

The following control characters are prohibited in all string values: (U+0000–U+0008), (U+000B–U+000C), (U+000E–U+001F), (U+007F). String values used as ID's are further limited to a character set representing common printable characters (U+0020–U+007E).

Most string values must have normalized whitespace. A string value with normalized whitespace cannot begin or end with whitespace characters, cannot contain any whitespace characters other than the space character (U+0020), and cannot contain any sequence of two or more contiguous space characters.

Normalized whitespace is not required for string values used for remarks or other expository text.

Comparison of string values for the purpose of verifying key constraints is not case sensitive.

Empty string values are interpreted as equivalent to null values for fields with a string data type. Records must include non-empty string values for string fields that cannot be null.

2.1.7 Task Outline Hierarchical Structure

The hierarchical structure of the task outline is determined based on the level and sequence of the nodes reported. Specifically, nodes must be sorted in a manner consistent with a depth-first search of the node hierarchy, such that the parent node of a given node must be the nearest preceding node with a reported level less than that of the given node. Each node that succeeds another must have a level that is no more than 1 greater than the level of the preceding node. The minimum level is 1.

2.2 Tables

2.2.1 DatasetMetadata

Table	DatasetMetadata		
Entity	DatasetMetadata		
Fields	Name	Data Type	Nullable
	SecurityMarking	String	No
	DistributionStatement	Text	Yes
	ReportingPeriodEndDate	Date	No
	ContractorName	String	Yes
	ContractorIDCodeTypeID	StringID	Yes
	ContractorIDCode	String	Conditional
	ContractorAddress_Street	Text	Yes
	ContractorAddress_City	String	Yes
	ContractorAddress_State	String	Yes
	ContractorAddress_Country	String	Yes
	ContractorAddress_ZipCode	String	Yes
	PointOfContactName	String	Yes
	PointOfContactTitle	String	Yes
	PointOfContactTelephone	String	Yes
	PointOfContactEmail	String	Yes
	ContractName	String	Yes
	ContractNumber	String	Yes
	ContractType	String	Yes
	ContractTaskOrEffortName	String	Yes
	ProgramName	String	Yes
	ProgramPhase	String	Yes
	EVMSAccepted	Boolean	Yes
	EVMSAcceptanceDate	Date	Conditional
Primary Key	[N/A]		
Foreign Keys	ContractorIDCodeTypeID: ContractorIDCodeTypeEnum(ID)		
Use Constraints	<p>DatasetMetadata is a singleton.</p> <p>ContractorIDCode must be null unless ContractorIDCodeTypeID is not null.</p> <p>EVMSAcceptanceDate must be null unless EVMSAccepted has a value of True.</p>		

2.2.2 SourceSoftwareMetadata

Table	SourceSoftwareMetadata		
Entity	SourceSoftwareMetadata		
Fields	Name	Data Type	Nullable
	Data_SoftwareName	String	Yes
	Data_SoftwareVersion	String	Yes
	Data_SoftwareCompanyName	String	Yes
	Data_SoftwareComments	Text	Yes
	Export_SoftwareName	String	Yes
	Export_SoftwareVersion	String	Yes
	Export_SoftwareCompanyName	String	Yes
	Export_SoftwareComments	Text	Yes
Primary Key	[N/A]		
Foreign Keys	[N/A]		
Use Constraints	SourceSoftwareMetadata is a singleton.		

2.2.3 ProjectScheduleData

Table	ProjectScheduleData		
Entity	ProjectScheduleData		
Fields	Name	Data Type	Nullable
	StatusDate	Date	No
	CurrentStartDate	Date	No
	CurrentFinishDate	Date	No
	BaselineStartDate	Date	Yes
	BaselineFinishDate	Date	Yes
	ActualStartDate	Date	Yes
	ActualFinishDate	Date	Yes
	DurationUnitsID	StringID	No
Primary Key	[N/A]		
Foreign Keys	DurationUnitsID: DurationUnitsEnum(ID)		
Use Constraints	ProjectScheduleData is a singleton.		

2.2.4 ProjectCustomFieldDefinitions

Table	ProjectCustomFieldDefinitions		
Entity	ProjectCustomFieldDefinition		
Fields	Name	Data Type	Nullable
	CustomFieldID	StringID	No
	Name	String	No
	Comments	Text	Yes
Primary Key	CustomFieldID		
Foreign Keys	CustomFieldID: CustomFieldEnum(ID)		
Use Constraints			

2.2.5 ProjectCustomFieldValues

Table	ProjectCustomFieldValues		
Entity	ProjectCustomFieldValue		
Fields	Name	Data Type	Nullable
	CustomFieldID	StringID	No
	Value	String	No
Primary Key	CustomFieldID		
Foreign Keys	CustomFieldID: ProjectCustomFieldDefinition(CustomFieldID)		
Use Constraints			

2.2.6 Calendars

Table	Calendars		
Entity	Calendar		
Fields	Name	Data Type	Nullable
	ID	StringID	No
	Name	String	No
	Comments	Text	Yes
Primary Key	ID		
Foreign Keys	[N/A]		
Use Constraints	Each record must have at least one associated record in the CalendarWorkshifts table.		

2.2.7 CalendarWorkshifts

Table	CalendarWorkshifts		
Entity	CalendarWorkshift		
Fields	Name	Data Type	Nullable
	CalendarID	StringID	No
	Ordinal	Integer	Yes
	SundayWorkHours	Decimal	Yes
	MondayWorkHours	Decimal	Yes
	TuesdayWorkHours	Decimal	Yes
	WednesdayWorkHours	Decimal	Yes
	ThursdayWorkHours	Decimal	Yes
	FridayWorkHours	Decimal	Yes
	SaturdayWorkHours	Decimal	Yes
Primary Key	CalendarID, Ordinal		
Foreign Keys	CalendarID: Calendar(ID)		
Use Constraints	<p>If null, Ordinal has a default value of zero.</p> <p>If null, each WorkHours field has a default value of zero; if not null, each must be greater than or equal to zero.</p> <p>At least one WorkHours field must be greater than zero.</p>		

2.2.8 CalendarExceptions

Table	CalendarExceptions		
Entity	CalendarException		
Fields	Name	Data Type	Nullable
	CalendarID	StringID	No
	ExceptionDate	Date	No
	WorkHours	Decimal	Yes
Primary Key	CalendarID, ExceptionDate		
Foreign Keys	CalendarID: Calendar(ID)		
Use Constraints	If null, WorkHours has a default value of zero. If not null, WorkHours must be greater than or equal to zero.		

2.2.9 Tasks

Table	Tasks		
Entity	Task		
Fields	Name	Data Type	Nullable
	ID	StringID	No
	Name	String	No
	TaskTypeID	StringID	No
	TaskSubtypeID	StringID	Yes
	TaskPlanningLevelID	StringID	Conditional
	WBSElementID	StringID	Yes
	OBSElementID	StringID	Yes
	ControlAccountID	StringID	Yes
	WorkPackageID	StringID	Yes
	IMPElementID	StringID	Yes
	SOWReference	String	Yes
	SubcontractorReference	String	Yes
	EarnedValueTechniqueID	StringID	Yes
	OtherEarnedValueTechnique	String	Conditional
	SourceSubprojectReference	String	Yes
	SourceTaskReference	String	Yes
Comments	Text	Yes	
Primary Key	ID		
Foreign Keys	TaskTypeID: TaskTypeEnum(ID) TaskSubtypeID: TaskSubtypeEnum(ID) TaskPlanningLevelID: TaskPlanningLevelEnum(ID) EarnedValueTechniqueID: EarnedValueTechniqueEnum(ID)		
Use Constraints	TaskPlanningLevelID must not be null if TaskTypeID has a value of ACTIVITY. OtherEarnedValueTechnique must be null unless EarnedValueTechniqueID has a value of OTHER_DISCRETE or FIXED_X_Y. Each record must have an associated record in the TaskScheduleData table. Each record with TaskTypeID equal to SUMMARY must have a record in the TaskOutlineStructure table associated by TaskID.		

2.2.10 TaskScheduleData

Table	TaskScheduleData		
Entity	TaskScheduleDataRecord		
Fields	Name	Data Type	Nullable
	TaskID	StringID	No
	CalendarID	StringID	No
	CurrentDuration	Decimal	No
	CurrentStartDate	Date	No
	CurrentFinishDate	Date	No
	EarlyStartDate	Date	No
	EarlyFinishDate	Date	No
	LateStartDate	Date	No
	LateFinishDate	Date	No
	FreeFloatDuration	Decimal	No
	TotalFloatDuration	Decimal	No
	OnCriticalPath	Boolean	No
	OnDrivingPath	Boolean	Yes
	BaselineDuration	Decimal	Yes
	BaselineStartDate	Date	Yes
	BaselineFinishDate	Date	Yes
	StartVarianceDuration	Decimal	Yes
	FinishVarianceDuration	Decimal	Yes
	CalculatedPercentComplete	Decimal	No
	PhysicalPercentComplete	Decimal	Yes
	RemainingDuration	Decimal	No
	ActualStartDate	Date	Yes
	ActualFinishDate	Date	Yes
Primary Key	TaskID		
Foreign Keys	TaskID: Task(ID) CalendarID: Calendar(ID)		
Use Constraints	The following fields must be reported together: BaselineDuration, BaselineStartDate, BaselineFinishDate, StartVarianceDuration, and FinishVarianceDuration. That is, all must be null or all must not be null.		

2.2.11 TaskCustomFieldDefinitions

Table	TaskCustomFieldDefinitions		
Entity	TaskCustomFieldDefinition		
Fields	Name	Data Type	Nullable
	CustomFieldID	StringID	No
	Name Comments	String Text	No Yes
Primary Key	CustomFieldID		
Foreign Keys	CustomFieldID: CustomFieldEnum(ID)		
Use Constraints			

2.2.12 TaskCustomFieldValues

Table	TaskCustomFieldValues		
Entity	TaskCustomFieldValue		
Fields	Name	Data Type	Nullable
	TaskID	StringID	No
	CustomFieldID Value	StringID String	No No
Primary Key	TaskID, CustomFieldID		
Foreign Keys	TaskID: Task(ID) CustomFieldID: TaskCustomFieldDefinition(CustomFieldID)		
Use Constraints			

2.2.13 TaskConstraints

Table	TaskConstraints		
Entity	TaskConstraint		
Fields	Name	Data Type	Nullable
	TaskID	StringID	No
	ConstraintTypeID	StringID	No
	OtherConstraintType	String	Conditional
	ConstraintDate	Date	Conditional
Primary Key	TaskID, ConstraintTypeID		
Foreign Keys	TaskID: Task(ID) ConstraintTypeID: TaskConstraintType(ID)		
Use Constraints	OtherConstraintType must be null unless ConstraintTypeID has a value of OTHER. ConstraintDate must not be null unless ConstraintTypeID has a value of AS_LATE_AS_POSSIBLE or OTHER.		

2.2.14 TaskRelationships

Table	TaskRelationships		
Entity	TaskRelationship		
Fields	Name	Data Type	Nullable
	PredecessorTaskID	StringID	No
	SuccessorTaskID	StringID	No
	RelationshipTypeID	StringID	No
	LagDuration	Decimal	Yes
	LagCalendarID	StringID	Yes
Primary Key	PredecessorTaskID, SuccessorTaskID, RelationshipTypeID		
Foreign Keys	PredecessorTaskID: Task(ID) SuccessorTaskID: Task(ID) RelationshipTypeID: TaskRelationshipTypeEnum(ID) LagCalendarID: Calendar(ID)		
Use Constraints	If null, LagCalendarID defaults to the ID of the calendar associated with the successor task.		

2.2.15 TaskOutlineStructure

Table	TaskOutlineStructure		
Entity	TaskOutlineNode		
Fields	Name	Data Type	Nullable
	Level	Integer	No
	TaskID	StringID	No
	ParentTaskID	StringID	Conditional
Primary Key	TaskID		
Foreign Keys	TaskID: Task(ID) ParentTaskID: Task(ID)		
Use Constraints	<p>Order of records is significant. In particular, hierarchical structure is determined based on level and sequence of records. See above.</p> <p>The first record must have Level equal to 1. All other records must have Level greater than or equal to 1.</p> <p>Records with Level equal to 1 must have a null ParentTaskID. All other records must have a ParentTaskID equal to the TaskID of the parent record determined by the hierarchical structure.</p> <p>Every parent record determined by the hierarchical structure must be associated by TaskID with a record in the Tasks table with TaskTypeID equal to SUMMARY.</p>		

2.2.16 Resources

Table	Resources		
Entity	Resource		
Fields	Name	Data Type	Nullable
	ID	StringID	No
	Name	String	No
	ElementOfCostID	StringID	No
	Comments	Text	Yes
Primary Key	ID		
Foreign Keys	ElementOfCostID: ElementOfCostEnum(ID)		
Use Constraints			

2.2.17 ResourceCustomFieldDefinitions

Table	ResourceCustomFieldDefinitions		
Entity	ResourceCustomFieldDefinition		
Fields	Name	Data Type	Nullable
	CustomFieldID	StringID	No
	Name	String	No
	Comments	Text	Yes
Primary Key	CustomFieldID		
Foreign Keys	CustomFieldID: CustomFieldEnum(ID)		
Use Constraints			

2.2.18 ResourceCustomFieldValues

Table	ResourceCustomFieldValues		
Entity	ResourceCustomFieldValue		
Fields	Name	Data Type	Nullable
	ResourceID	StringID	No
	CustomFieldID	StringID	No
	Value	String	No
Primary Key	ResourceID, CustomFieldID		
Foreign Keys	ResourceID: Resource(ID) CustomFieldID: ResourceCustomFieldDefinition(CustomFieldID)		
Use Constraints			

2.2.19 ResourceAssignments

Table	ResourceAssignments		
Entity	ResourceAssignment		
Fields	Name	Data Type	Nullable
	ResourceID	StringID	No
	TaskID	StringID	No
	Budget_AtCompletion_Dollars	Decimal	Yes
	Budget_AtCompletion_Hours	Decimal	Yes
	Estimate_ToComplete_Dollars	Decimal	Yes
	Estimate_ToComplete_Hours	Decimal	Yes
	Actual_ToDate_Dollars	Decimal	Yes
	Actual_ToDate_Hours	Decimal	Yes
PhysicalPercentComplete	Decimal	Yes	
Primary Key	ResourceID, TaskID		
Foreign Keys	ResourceID: Resource(ID)		
	TaskID: Task(ID)		
Use Constraints			

2.3 Primitive Data Types

Primitive Data Types	
Boolean	Values of two-valued logic (i.e. “true” and “false”).
Date	Year, month, and day, without reference to the time of day or a specific time zone.
Decimal	Number that can be represented with decimal digits, with possible integral and/or fractional component.
Integer	Number that can be represented with decimal digits, with no fractional component.
String	A sequence of Unicode characters, with normalized whitespace.
StringID	A sequence of Unicode characters, with normalized whitespace and limited character set.
Text	A sequence of Unicode characters intended for remarks or other expository text.

2.4 Enumerations

2.4.1 ContractorIDCodeTypeEnum

Enumeration	ContractorIDCodeTypeEnum	
Values	ID	Name
	DUNS	DUNS
	DUNS_PLUS_4	DUNS+4
	CAGE	CAGE
Use Constraints		

2.4.2 DurationUnitsEnum

Enumeration	DurationUnitsEnum	
Values	ID	Name
	DAYS	Days
	HOURS	Hours
Use Constraints		

2.4.3 TaskTypeEnum

Enumeration	TaskTypeEnum	
Values	ID	Name
	ACTIVITY	Activity
	MILESTONE	Milestone
	SUMMARY	Summary
	HAMMOCK	Hammock
Use Constraints		

2.4.4 TaskSubtypeEnum

Enumeration	TaskSubtypeEnum	
Values	ID	Name
	RISK_MITIGATION_TASK	Risk Mitigation Task
	SCHEDULE_VISIBILITY_TASK	Schedule Visibility Task
	SCHEDULE_MARGIN	Schedule Margin
	CONTRACTUAL_MILESTONE	Contractual Milestone
Use Constraints		

2.4.5 TaskPlanningLevelEnum

Enumeration	TaskPlanningLevelEnum	
Values	ID	Name
	SUMMARY_LEVEL_PLANNING_PACKAGE	Summary Level Planning Package
	CONTROL_ACCOUNT	Control Account
	PLANNING_PACKAGE	Planning Package
	WORK_PACKAGE	Work Package
	ACTIVITY	Activity
Use Constraints		

2.4.6 EarnedValueTechniqueEnum

Enumeration	EarnedValueTechniqueEnum	
Values	ID	Name
	APPORTIONED_EFFORT	Apportioned Effort
	LEVEL_OF_EFFORT	Level of Effort
	MILESTONE	Milestone
	FIXED_0_100	0/100
	FIXED_100_0	100/0
	FIXED_X_Y	X/Y
	PERCENT_COMPLETE	Percent Complete
	STANDARDS	Standards
	UNITS	Units
	OTHER_DISCRETE	Other Discrete
Use Constraints		

2.4.7 TaskConstraintTypeEnum

Enumeration	TaskConstraintTypeEnum	
Values	ID	Name
	START_NO_EARLIER_THAN	Start No Earlier Than
	FINISH_NO_EARLIER_THAN	Finish No Earlier Than
	START_NO_LATER_THAN	Start No Later Than
	FINISH_NO_LATER_THAN	Finish No Later Than
	MUST_START_ON	Must Start On
	MUST_FINISH_ON	Must Finish On
	AS_LATE_AS_POSSIBLE	As Late As Possible
	SHOULD_START_NO_LATER_THAN	Should Start No Later Than
	SHOULD_FINISH_NO_LATER_THAN	Should Finish No Later Than
	SHOULD_START_ON	Should Start On
	SHOULD_FINISH_ON	Should Finish On
	RESOURCE_LEVELING_START_DELAY	Resource Leveling Start Delay
	RESOURCE_LEVELING_FINISH_DELAY	Resource Leveling Finish Delay
	DEADLINE	Deadline
OTHER	Other	
Use Constraints		

2.4.8 TaskRelationshipTypeEnum

Enumeration	TaskRelationshipTypeEnum	
Values	ID	Name
	FINISH_TO_START	Finish-to-Start
	START_TO_START	Start-to-Start
	FINISH_TO_FINISH	Finish-to-Finish
	START_TO_FINISH	Start-to-Finish
Use Constraints		

2.4.9 ElementOfCostEnum

Enumeration	ElementOfCostEnum	
Values	ID	Name
	LABOR	Labor
	MATERIAL	Material
	OTHER_DIRECT_COSTS	Other Direct Costs
	SUBCONTRACT	Subcontract
Use Constraints		

2.4.10 CustomFieldEnum

Enumeration	CustomFieldEnum	
Values	ID	Name
	FIELD_01	Field 01
	FIELD_02	Field 02
	FIELD_03	Field 03
	FIELD_04	Field 04
	FIELD_05	Field 05
	FIELD_06	Field 06
	FIELD_07	Field 07
	FIELD_08	Field 08
	FIELD_09	Field 09
FIELD_10	Field 10	
Use Constraints		

3 File Format

The file format for an IPMDAR Schedule Performance Dataset is a ZIP file containing multiple text file entries. One text file entry conveys type and version information. All other text file entries convey data represented in JSON. Each JSON file entry corresponds to a single data table.

3.1 File Conventions

Text file entries must be encoded in UTF-8. Compressed file entries must be compressed using the DEFLATE compression method. File entries must not be encrypted.

The file entry for a table may be omitted if the table has no records. The file entry for a singleton may be omitted if all its fields are null. The file entry for type/version information must always be included.

3.2 File Contents

ZIP File Entries		
	Name	Table
	FileType.txt	[N/A]
	DatasetMetadata.json	DatasetMetadata
	SourceSoftwareMetadata.json	SourceSoftwareMetadata
	ProjectScheduleData.json	ProjectScheduleData
	ProjectCustomFieldDefinitions.json	ProjectCustomFieldDefinitions
	ProjectCustomFieldValues.json	ProjectCustomFieldValues
	Calendars.json	Calendars
	CalendarWorkshifts.json	CalendarWorkshifts
	CalendarExceptions.json	CalendarExceptions
	Tasks.json	Tasks
	TaskScheduleData.json	TaskScheduleData
	TaskCustomFieldDefinitions.json	TaskCustomFieldDefinitions
	TaskCustomFieldValues.json	TaskCustomFieldValues
	TaskConstraints.json	TaskConstraints
	TaskRelationships.json	TaskRelationships
	TaskOutlineStructure.json	TaskOutlineStructure
	Resources.json	Resources
	ResourceCustomFieldDefinitions.json	ResourceCustomFieldDefinitions
	ResourceCustomFieldValues.json	ResourceCustomFieldValues
	ResourceAssignments.json	ResourceAssignments

3.3 File Type/Version

The 'FileType.txt' file entry specifies the type and version of the IPMDAR Schedule Performance Dataset file. This file entry must contain the following exact text string (excluding quotation marks):

"IPMDAR_SCHEDULE_PERFORMANCE_DATASET/1.0".

4 Representation in JSON

4.1 JSON Conventions

Each table is represented in JSON as an array of objects. Singletons are an exception. They are represented directly as a single object. Objects correspond to records, and the sequence of objects in JSON represents the implicit sequence of records in the table.

Each record is represented in JSON as an object with name/value pairs corresponding to field values. The name of each pair must exactly match the name of the corresponding field, and the value of each pair must follow the conventions below for representing the corresponding primitive data type in JSON. Names must be unique within the scope of each object and each name must correspond to a field defined for the table.

Objects must include name/value pairs for fields that are not null, and these pairs must not have a JSON value of null or an empty JSON string value. Conversely, objects may or may not include name/value pairs for fields that are null. If included, these pairs may have a JSON value of null or an empty JSON string value. Only pairs for fields with a primitive data type of String, StringID, or Text may have an empty JSON string value.

Primitive data types are represented as follows:

Representation of Primitive Data Types	
Boolean	JSON value of true or false.
Date	JSON string encoding a valid date, without time component or time zone, formatted as follows: "yyyy-mm-dd" (e.g. "2016-01-31").
Decimal	JSON number.
Integer	JSON number with fractional component equal to zero.
String	JSON string, with normalized whitespace.
StringID	JSON string, with normalized whitespace and limited character set.
Text	JSON string.

4.2 JSON Schema Sample

Schema	Resources.json
	<pre>{ "\$schema": "http://json-schema.org/draft-04/schema#", "type": "array", "items": { "type": "object", "properties": { "ID": {"type": "string"}, "Name": {"type": "string"}, "ElementOfCostID": {"type": "string"}, "Comments": {"type": ["string", "null"]} }, "required": ["ID", "Name", "ElementOfCostID"] } }</pre>

4.3 JSON Data Sample

Data	Resources.json
<pre>[{ "ID": "ENG-01", "Name": "Engineering 01", "ElementOfCostID": "LABOR" }, { "ID": "ENG-02", "Name": "Engineering 02", "ElementOfCostID": "LABOR" }, { "ID": "MAT-01", "Name": "Material 01", "ElementOfCostID": "MATERIAL" }]</pre>	

5 References

JSON - The JSON Data Interchange Format, ECMA-404. 2013.

JSON Schema - json-schema.org

Unicode - The Unicode Standard, Version 9.0. 2016.

UTF-8 - "UTF-8 encoding scheme," The Unicode Standard, Version 9.0, §3.10 D95. 2016.

ZIP File Format - .ZIP File Format Specification, Version 6.3.4. 2014.