

Toronto Water WMS Configuration Schema

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Folder: 1-Schemas

Folder: A-entity_record_schema

00_common_definitions.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: common properties of all entities
4  $id:
5      ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/A-entity_record_schema/00_co
6
7  definitions:
8
9      #=====
10     # INVENTORY
11     #=====
12
13     stocked_at_TW_def:
14
15         type: boolean
16         description: a true value indicates that the item is a stocked item at the
17         ↪ Toronto Water
18
19         TW_rule:
20             - name: default value of .properties.stocked_at_TW
21               spec_ID: EkxMAfT5ee
22               specification: |
23                 For a given item_or_tool_x,
24                 the value of item_or_tool_x.properties.stocked_at_TW is set to false by
25                 ↪ default
26
27         rotating_property_def:
28
29             type: boolean
30
31             $comment: |
32                 For posterity: a rotating item is a trackable item - each instance of the item
33                 ↪ being a rotating asset record. When the value of this field is true, we must
34                 ↪ serialize every instance of the item. This commitment is beyond what we can
35                 ↪ presently achieve at TW. The more pragmatic starting point considered in 2024 is
36                 ↪ as follows:
37
38                 1) for the initial implementation, specify all items as non-rotating
39                 2) an non-rotating item definition, containing the mfr, model, and
40                 ↪ ordering_information, can be associated with any asset, through the the asset's
41                 ↪ item_product_master_record property.
42
43                 2) in the future, if we wish to convert the non-rotating item definition to
44                 ↪ a rotating item definition, we would serialize all the assets associated to the
45                 ↪ item definition, and convert them to rotating assets.
46
47         rule_spec:
```

```
36     - name: value of .properties."rotating item"
37       spec_ID: 4JKH1tw9gx
38       type: [validation, assertion]
39       specification: |
40         For a given item_x,
41           the value of item_x.properties."rotating flag" is set to false, for all
↪ time
42       $comment:
43       status: specified
44
45 manufacturer_and_model_def:
46
47 type: object
48 properties:
49
50   manufacturer:
51     $ref: MaximoCompanyObject
52
53   product_model:
54     $ref: "#/definitions/product_model_def"
55
56 product_model_def:
57
58 type: object
59 properties:
60
61   model_and_sub-model:
62     oneOf:
63     - type: null
64     - type: string
65     description: For example, "Multilin 869"
66
67   version_or_model_year:
68     oneOf:
69     - type: null
70     - type: string
71     description: Identifies the specific version of the product model. For
↪ example "v2" or "2023".
72
73   manufacturer_PN:
74     oneOf:
75     - type: null
76     - type: string
77     description: The manufacturer designator identifying the exact product item.
78
79 plain-text_manufacturer_and_model_def:
80   type: object
81
82   $comment: |
83     The following is an example of the plain text manufacturer and model
↪ definition
84     manufacturer: General Electric
85     model_and_sub-model: Multilin 750
```

```
86     version_or_model_year: 2024
87
88     #=====
89     # FAILURE
90     #=====
91
92     failure_code:
93
94         type: object
95         properties:
96
97             code:
98                 type: string
99
100             name:
101                 type: string
102
103             description:
104                 type: string
105
106             failure_code_type:
107                 type: string
108                 enum:
109                     - problem
110                     - cause
111                     - remedy
112
113             site:
114                 type: object
115                 $ref: MaximoSiteObject
116
117             failure_classes:
118                 oneOf:
119                     - type: null
120                     - type: array
121                       items:
122                         type: object
123                         $ref: MaximoFailureClass
124
125             status:
126                 type: string
127                 enum:
128                     - draft
129                     - approved
130
131     #=====
132     # JOB PLAN RESOURCE
133     #=====
134
135     item_requirement_definition:
136     #-----
137         properties:
138
```

```
139     item_reference:
140       $ref: "../05_item_master.yml"
141
142     required_quantity:
143       type: number
144
145     unit:
146       $ref: "#/definitions/unit_of_measure"
147
148   tool_requirements_definition:
149     #-----
150     properties:
151
152       tool_reference: # reference for both stocked and un-stocked tool
153         $ref: "../06_tool_master.yml"
154
155       required_quantity:
156         type: number
157
158   service_requirement_definition:
159     #-----
160     properties:
161
162       service_reference:
163         $ref: "../07_service_item_master.yml"
164
165       required_quantity:
166         type: number
167
168       unit:
169         type: string
170         enum: >
171           - hour
172           - instance
173
174   trade_requirement_definition:
175     #-----
176     properties:
177
178       trade_type:
179         $ref: "../B-entity_class_object_schema/08_trade_type.yml"
180
181       required_quantity:
182         type: number
183
184       qualification_requirement:
185         oneOf:
186           - type: null
187           - type: array
188             items:
189               $ref: "../B-entity_class_object_schema/09_qualification.yml"
190
191     #=====
```

```
192 # UNIT OF MEASURE
193 #=====
194
195 unit_of_measure:
196
197     description: Represents a unit of measure (UOM) used in inventory management to
↵ track quantities of items.
198
199     properties:
200
201         code:
202
203             description: is the unique identifier or code for the unit of measure.
204             type: string
205             $comment: e.g., "EA", "kg"
206
207         name:
208
209             description: is the full name of the unit of measure.
210             type: string
211             $comment: e.g., "Each", "kilogram"
212
213 #=====
214 # Record Retirement
215 #=====
216
217 record_retirement_definition:
218
219     properties:
220
221         record_retired:
222             type: Boolean
223
224         reason_for_retirement:
225             oneOf: [type: string, type: null]
226             updated_by_system: true
227             sort_order: 20-20
228             $comment: the value should be written by the system, from a asset or record
↵ retirement transaction.
229
230 frequency_interval_definition:
231
232     properties:
233
234         frequency_quantity:
235
236             type: number
237
238
239         unit_of_time:
240
241             type: string
242             enum:
```

```
243     - minute
244     - hour
245     - day
246     - month
247     - year
248
249     #=====
250     # Record Duplication
251     #=====
252
253     duplicate record of:
254
255     oneOf:
256       - type: array
257         items:
258           $ref: "../01_asset.yml"
259       - type: null
260
261     #=====
262
263     record retirement information:
264       $ref: "../00_common_definitions.yml#/definitions/record retirement definition"
265
266     #=====
267     #
268     #=====
269
270     meter_condition_definition:
271
272     properties:
273
274     meter:
275
276       description: is a selection of a pre-defined meter.
277       $ref: default_WMS_meter_object
278
279     numeric_frequency_value:
280
281     oneOf:
282       - type: null
283       - type: number
284
285     characteristic_trigger_value:
286
287     oneOf:
288       - type: null
289       - type: string
290
291
292     reference_attachment:
293
294     properties:
```



```
296     document:
297     document_content_class:
298
299         type: string
300         enum:
301             - maintenance manual
302             - asset photograph
303             -
304
305     #=====
306     # Compliance Requirement Definition
307     #=====
308
309     compliance_requirement:
310
311         properties:
312
313             name:
314
315                 type: string
316                 $comment: |
317                     For example, 'ANSI Z358.1-2014 on weekly inspection of self-contained
↵ emergency wash equipment'.
318
319             requirement_detail:
320
321                 description: provides all relevant descriptions
322                 type: string
323                 $comment: |
324                     The following is an example of the requirement detail text for a
↵ compliance requirement.
325
326                     applicable_asset_class:
327                         - emergency eye-wash
328
329                     requirement_source(s):
330                         - ANSI Z358.1-2014 / Emergency Eyewash & Shower Standard / 4 Emergency
↵ Showers / 4.6 Maintenance and Training
331                         ...
332                         - ANSI Z358.1-2014 / Emergency Eyewash & Shower Standard / 4 Emergency
↵ Showers / 4.5 Installation
333                         ...
334
335                     source_content_guide:
336                         - ANSI Z358.1-2014 4.6 states the requirement to check that shower
↵ still meets standards
337                         - ANSI Z358.1-2014 4.5 states the standards to apply for ht check
338
339                     perform_every:
340                         - year
341
342             requirement_compliance_class:
```

```
344         description: indicates the level of compliance, with legislative being the
↪ top
345         $ref: "#/compliance_class"
346
347     compliance_class:
348
349         type: string
350         enum:
351             - legislative
352             - corporate policy
353
354
355     #####
356     # Common Work Entity Definition
357     #####
```

01_asset.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5  type: object
6
7  $comment: >
8
9  properties:
10
11      ID:
12
13          type: string
14          description: A read-only UUID, generated by the system, to uniquely identify the
↪ asset record.
15          rule_spec:
16              - name: vertical asset ID
17                spec_ID: 41JeoQuvex
18                type: [assertion]
19                specification: |
20                    Upon the creation of a new vertical facility asset record generate a
↪ unique ID (such as UUID Ver4)
21                checked_on: 2024-08-15
22                $comment: |
23                    UUID has a distinct advantage over a simple serial number - we do not need
↪ a script to check for repetition. For instance, when onboarding assets from
↪ another system or a spreadsheet, we don't need to check the WMS to see if the ID
↪ was already taken.
24              - name: linear_asset_ID
25                spec_ID: Vku-67dDxx
26                type: [assertion]
27                specification: |
```

```
28     Upon the creation of a new asset record corresponding to a record in TWAG,
↪ through the Maximo-TWAG integration,
29     populate the TWAG_asset record's "Facility ID" value into the "ID".
30     checked_on: 2024-08-15
31     $comment: see comment for rule 41JeoQuvex.
32
33     name:
34
35     type: string
36     description: The human readable short description of the asset.
37     $comment: |
38         Assumption: an non-is a specific commercial product is always built on site
↪ for a specific purpose, and would permanently occupy a role. An example is an
↪ aeration tank.
39     rule_spec:
40         - name: Asset Naming
41           spec_ID: 4ykhOm_Dle
42           type: assertion
43           specification: |
44               if asset_x.properties."is_a_commercially_available_product" = TRUE
45                   asset_x.properties.name is the semi-colon delimited concatenation of:
46                       - asset_x.properties.class.properties."class name"
47                       - asset_x.properties."item_product_master_record".properties.product
↪ manufacturer company
48                   -
↪ asset_x.properties."item_product_master_record".properties.model_and_sub-model
49                   - asset_x.properties."item_product_master_record".properties.product
↪ configuration code
50                   - asset_x.properties."OEM_serial"
51               elif asset_x.properties."is_a_commercially_available_product" = FALSE
52                   asset_x.properties.name is the semi-colon delimited concatenation of:
53                       - asset_x.properties.class.properties."class name"
54                       - asset_x.properties."assigned_to_role".properties.name
55               # NOTE: actual script should contain additional condition handle
↪ formatting of the name text when there is missing data in any concatenated
↪ property.
56         status:
57             checked: 2024-08-15
58
59     class:
60
61     $ref: "../B-entity_class_object_schema/01_asset_item_tool_class.yml"
62     description: Indicates the primitive class to which this asset is an instance.
63     rule_spec:
64         - name: exclusion of parts ("only used as a part asset") from asset
↪ classification
65         spec_ID: V15NNHZuxl
66         type: [validation, UI]
67         specification: |
68             Assertion Part:
69             For all assets "asset_x",
70             the value of (asset_x.class.properties.only used as a part asset) must
↪ be FALSE
```

```
71     UI Part:
72     In all asset classification search or selection screens, eliminate or
↪ filter out all classes "class_y",
73
74     where (class_y.properties.only used as a part asset) is TRUE
75     checked_on: 2024-08-15
76
77     class_dependent_specifications:
78
79     type: object
80     description: is a set of properties applicable to the class.
81
82     inferred_classes:
83
84     oneOf:
85     - type: array
86       items:
87         type: string
88     - type: null
89     read-only: true
90     integration: true
91     description: Indicates the complex classes to which this asset is an instance. A
↪ complex class is defined with reference to a primitive class plus other
↪ attributes. An example of a complex class is the TSSA high-pressure boiler
↪ class, which is made with reference to th primitive class boiler.
92     $comment: |
93     To implementer: this field will be populated by a rule processor, operating
↪ outside of Maximo and with integration to Maximo. An example of the inferred
↪ class is "high-pressure boiler". The values are strings instead of
↪ classification objects because the inferred classes will not be in Maximo's
↪ asset classification.
94
95
96 ## STATE AND STATUS GROUP OF PROPERTIES
97 #=====
98
99     physical_status:
100
101     type: string
102     description: Indicates whether the asset is present at the City, and more
↪ precisely, at its working location. It also indicates when the knowledge of the
↪ asset's presence is missing (i.e., it is missing or lost).
103     enum:
104     - planned
105     - in possession
106     - installed
107     - abandoned in place
108     - removed from possession
109     - missing
110     - lost
111     $comment: |
112     This data field is not nullable because the lack of knowledge is explicitly
↪ expressed as "missing" or "lost", and the non-existence is expressed as
↪ "planned" or "removed from possession".
```

```
113
114   operating_state:
115
116     type: string
117     description: Indicates whether the asset is available for doing the work that it
↪ is assigned at a given moment. Only applies to asset that is assigned to a role,
↪ user-group, or user.
118     enum:
119       - available (up)
120       - unavailable (down)
121       - not applicable
122     $comment: |
123       To data architect and implementer: the "not applicable" value is important,
↪ because when we are reporting on equipment uptime, we need to know about the
↪ periods in which the operating state is not applicable. For example, if the
↪ asset is not assigned to any role, organization, or anyone.
124
125 ## OWNER, OPERATOR, MAINTAINER GROUP
126 #=====
127
128   owned_by_organization:
129
130     oneOf: [type: null, $ref: "./04_org_or_group.yml"]
131     description: Denotes the organization that owns the asset.
132     integration: true
133
134     rule_spec:
135       - name: valid values of "owned_by_organization" property
136         spec_ID: 410N2dr_xx
137         type: [validation,UI]
138         specification: |
139           - The valid range of values for selection includes the first or second of
↪ the organizational hierarchy, specified in the
↪ (\TWmaximoConfig\3-System_Hierarchies\04_org_hierarchy.md) . For examples,
140             - first level example: York Region,
141             - second level example: Toronto Water
142           - The UI must only present the valid range of values to the users for
↪ selection, and the valid range of values must be presented as a hierarchy.
143         checked_on: 2024-08-19
144
145   owned_by_another_organization:
146
147     oneOf:
148       - type: null
149       - type: string
150     description: name of an organization that is not found in the current list (and
↪ should be added)
151     integration: true
152     $comment: |
153       []To WIM, this data field should be added to the GIS to allow an asset record
↪ to be enter into the system, even if the organization that owns it had not been
↪ added to the value list.
154
```

```
155 maintenance_group:
156
157     oneOf: [type: null, $ref: "./04_org_or_group.yml"]
158     description: group responsible for the overall maintenance of the asset - for
↪     example, a unit, work area, or crew.
159
160 operator_group:
161
162     oneOf: [$ref: "./04_org_or_group.yml"]
163     description: group responsible for the operation of the asset
164     $comment: |
165         This property is not strictly needed for the vertical assets - their group can
↪     be inferred from their assignment (to role or user) values. This value is need
↪     for TWAG / linear assets.
166
167 rule_spec:
168     - name: inheriting the asset's maintenance and operator group values from its
↪     role
169         spec_ID: VJ1QRgIc1g
170         specification: |
171             - if the value of asset_x.properties.assigned_to_role is role_y, then
172               inherit the value of
173                 - asset_x.properties.maintenance_group
174                 - asset_x.properties.operator_group
175             from the same properties of role_y
176         checked_on: 2024-08-20
177
178
179 ## ASSIGNMENT GROUP OF PROPERTIES
180 #=====
181
182 assignment_type:
183
184     oneOf:
185         - type: string
186         - type: null
187     description:
188     enum:
189         - to a role
190         - to a user group
191         - to a single user
192         - not assigned
193     $comment: |
194         This property is added to assist with the interpretation of the null value in
↪     the "assigned_to_role", "assigned_to_tool_user_group", or
↪     "assigned_to_tool_user_group" property. If the value here is "not assigned",
↪     then we know the asset is not assigned to anything. If the value here is null,
↪     we do not know whether this asset is assigned to anything.
195
196 rule_spec:
197     - name: Rendering of (asset_x.properties."assignment_type") data field.
198       spec_ID: 4yARRuvOex
199       type: UI
```

```
200     description: |
201         the options of this property should be presented as radial button
202     status: specified
203
204 - name: Valid Assignment of an Asset
205   spec_ID: NyrzGKwuel
206   type: [validation, assertion, UI]
207   description: |
208       If asset_x.properties."assignment_type" = "to a role", then
209         - asset_x.properties."assigned_to_role" must NOT = null;
210         - asset_x.properties."assigned_to_tool_user" must = null
211         - asset_x.properties."assigned_to_tool_user_group" must = null
212       elif .properties."assignment_type" = "to a user group", then
213         - asset_x.properties."assigned_to_tool_user_group" must NOT = null;
214         - asset_x.properties."assigned_to_role" must = null
215         - asset_x.properties."assigned_to_tool_user" must = null
216       elif asset_x.properties."assignment_type" = "to a single user", then
217         - asset_x.properties."assigned_to_tool_user" must NOT = null;
218         - asset_x.properties."assigned_to_role" must = null
219         - asset_x.properties."assigned_to_tool_user_group" must = null
220       elif asset_x.properties."assignment_type" = null, then
221         - asset_x.properties."assigned_to_role" must = null
222         - asset_x.properties."assigned_to_tool_user" must = null
223         - asset_x.properties."assigned_to_tool_user_group" must = null
224       Also, in the UI screen, disable the properties that should = null
225   status: specified
226
227 assigned_to_role:
228
229   oneOf:
230     - $ref: "../02_role.yml"
231     - type: null
232   description: Role that the asset is designated to play. This value persists even
↪ if the asset is temporarily removed from the location of the role (for reasons
↪ such as repair).
233
234 assigned_to_tool_user_group:
235
236   oneOf:
237     - $ref: "../04_org_or_group.yml"
238     - type: null
239   description: A group of people, such as a facility, work area, or crew to whom
↪ the asset is assigned for use. Indicates the assignment of an asset (usually a
↪ tool) that does not have a system role.
240
241 assigned_to_tool_user:
242
243   oneOf:
244     - $ref: "../02_role.yml"
245     - type: null
246   description: Indicates the assignment of an asset (usually a tool) that does not
↪ have a system role.
247
```

```

248
249 ## LOCATION PROPERTY GROUP
250 #=====
251
252 installation_or_parking_location:
253
254   oneOf:
255     - $ref: "./03_space.yml"
256     - type: null
257
258 service_address_or_coordinate:
259
260   oneOf:
261     - $ref: MaximoServiceAddressObject
262     - type: null
263   $comment: |
264     this is referencing Maximo's native service address object
265   rule_spec:
266     - name: asset present at site must have location information on record
267       spec_ID: 01J5R2F9ARJDM3RMGE9WYZWVFE
268       type: [validation]
269       specification: |
270         if the value of asset_x.properties.physical_status is either
271           - "in possession", or
272           - "installed"
273         then at least one of the following properties must NOT be null
274           - asset_x.properties.installation_or_parking_location
275           - asset_x.properties.service_address_or_coordinate
276       check_on: 2024-08-20
277
278 parent_asset:
279
280   oneOf:
281     - $ref: "./01_asset.yml"
282     - type: null
283   description: >
284     Indicates the larger discrete asset or defined collection of assets, to which
↪ this asset is a part of. NOTE: this property is not meant to be used for
↪ specifying the system hierarchy parent. That property is found on the role
↪ record, not the asset record.
285   $comment: |
286     This field is commonly used when the asset is a part of a skid, structural
↪ tank, or switchgear cabinet, in which the asset parent in the system hierarchy
↪ should be the line entity. As such we will using this field to track that the
↪ asset is also a part of a physical assembly. We would also be using this field
↪ to capture a serialized rotating component as a part of another discrete asset.
↪ This field can also be used to indicate an asset membership in a Defined
↪ Collection of Assets.
287
288
289 ## PRODUCT AND TOOL ASSOCIATION GROUP
290 #=====
291

```



```
292   is_a_commercially_available_product:
293
294     type: boolean
295     description: An asset is made under as a product of a commercial entity, as
↪     opposed to an asset that is assembled on site.
296     $comment: No null value allowed because this information is self-evident
297
298     rule_spec:
299
300       - name: Automatic Value Assignment to
↪     properties."is_a_commercially_available_product"
301         spec_ID: 4Jg2gYS0ee
302         type: [assertion]
303         specification: |
304           - Upon record creation, set the value to TRUE.
305           - Upon a asset_x.properties.class value change or a re-run of the Maximo
↪     rule processor,
306             if asset_x.properties.class.properties."non-manufactured" = TRUE;
307               set the value to TRUE;
308             else set the value to FALSE.
309         status: [specified]
310
311   is_a_tool:
312
313     type: boolean
314     description: a tool is enables or enhances the ability of a human agent to
↪     perform a piece of maintenance, repair, testing, and investigative work. "true"
↪     value would designate the asset as a rotating tool, which allows the asset to be
↪     1. reserved for work, or 2. assigned to a staff or group (which includes fixed
↪     tools).
315     $comment: Note that this property was changed from "mobile" because this
↪     designation also applies to fixed tools, such as machine shop or lab tools. All
↪     of these assets fall within the definition of a tool.
316
317     rule_spec:
318
319       - name: Value of (.properties."is_a_tool") defaults to false
320         spec_ID: 41sz7KSdxe
321         type: assertion
322         specification: |
323           - Upon record creation, set the default value to FALSE.
324           - Upon a asset_x.properties.class value change or a re-run of the Maximo
↪     rule processor,
325             if asset_x.properties.class.properties.tool = TRUE;
326               then set the value to TRUE;
327         status: [specified, checked]
328
329   is_mobile:
330
331     oneOf:
332       - type: boolean
333       - type: null
334
```

```
335 rule_spec:
336
337   - name: mobiles need to have its serial number on record
338     spec_ID: EyA3sYa9le
339     type: validation
340     specification: |
341       For any asset_x,
342         if the value of asset_x.properties.is_a_tool is TRUE, and the value of
↪ asset_x.properties.is_mobile is also TRUE, then
343           the value of asset_x.properties.OEM_serial cannot be null.
344     check_on: 2024-08-20
345
346 item_product_master_record:
347
348   oneOf:
349     - $ref: "./05_item_master.yml"
350     - type: null
351   description: This field links the asset to an item record that defines a
↪ specific commercial product. By effect, it also deems to asset to be a rotating
↪ item.
352
353 rule_spec:
354
355   # - name: If an asset is commercially available but not a tool, then it must
↪ have mfr and model information.
356   #   spec_ID: VJY43yI9lx
357   #   type: [assertion, UI]
358   #   specification: |
359   #     if asset_x.properties.is_a_commercially_available_product = TRUE AND
↪ asset_x.properties.is_a_tool = FALSE, then
360   #       - (asset_x.properties."item_product_master_record") is NOT null
361   #       - enable (asset_x.properties."item_product_master_record") in UI
362   #     else
363   #       - (asset_x.properties."item_product_master_record") is null
364   #       - disable (asset_x.properties."item_product_master_record") in UI
365   #   status: TBS
366
367   - name: valid item master record in .properties.item_product_master_record
368     spec_ID: VJGKn1I9ex
369     type: validation
370     specification: |
371       For asset_x.properties.item_product_master_record,
372       only accept a master record whose value of
↪ asset_x.properties.generic_or_specific_product is "specific commercial product".
↪
373
374     status: [specified, checked]
375     $comment: related to 4y3dRfLcee
376
377 tool_product_master_record:
378
379   oneOf:
380     - $ref: "./06_tool_master.yml"
```

```
381     - type: null
382     description: A association with a master record designates the asset as a
↪ stocked tool, which allows the tool to be checked into a storeroom and tracked
↪ as a part of an inventory. Without an association, the tool would be
↪ non-stocked.
383
384     rule_spec:
385
386     - name: when to enable the tool_product_master_record
387       spec_ID: NyQBbeL9x1
388       specification: |
389         if asset_x.properties."is_a_tool" = TRUE
390           then enable (asset_x.properties."tool_product_master_record") property.
↪
391       status: [specified, checked]
392
393
394     - name: valid value of asset_x.properties.tool_product_master_record
395       spec_ID: NyFFWlUc11
396       type: validation
397       specification: |
398         only accept a tool_product_master_record whose
↪ .properties.generic_or_specific_product property value is "specific commercial
↪ product"
399       checked_on: 2024-08-20
400
401
402     - name: an asset may either be associated with a tool or an asset, not both
403       spec_ID:
404       type:
405       specification:
406       status: TBS
407       checked_on:
408
409     TW_workflow:
410
411     - name: creating a rotating tool directly from an asset record
412       specification: TBS []
413       status: work in progress
414
415
416 ## MANUFACTURER AND MODEL GROUP
417 #=====
418
419     commercial_product_information:
420       oneOf: [type: null,
↪ $ref:"./00_common_definitions.yml#/definitions/plain-text_manufacturer_and_model_def"]
421
422 ## DATE PROPERTY GROUP
423 #=====
424
425     construction_contract_number:
426
```

```
427     oneOf:
428       - type: string
429       - type: null
430     description: The construction_contract_number (usually RFQ#) assigned by the
↵ City
431
432     first_day_of_City_operation:
433
434       oneOf:
435         - type: string
436         - type: null
437       description: The day that the asset is turned over to the City from a
↵ contractor, or if the City installed the asset itself - the day the asset enters
↵ operation after testing is completed.
438       $comment: |
439         This usually coincides with "warranty start date". However, if the asset is
↵ not delivered through a project, "warranty start date" may be empty.
440
441     OEM_serial:
442
443       oneOf:
444         - type: string
445         - type: null
446       description: The serial number, affixed on the asset, designated by the
↵ manufacturer.
447       $comment: |
448         ASMP Discussion Log: The serial number is only populated when an asset
↵ experiences a movement (except for movement for removal), or when it is being
↵ check into a storeroom. Therefore, when the value of the OEM_serial is null, it
↵ represents the fact that we do not know what the serial number is (and whether
↵ it has a serial number at all).
449
450     purchase_cost_in_CAD:
451
452       description: the original purchase cost of the asset (not necessary if the asset
↵ is associated with a item master record)
453       oneOf:
454         - type: number
455         - type: null
456
457     asset_photos:
458
459       oneOf:
460         - type: array # "array" indicates asset may have multiple photos
461           items:
462             - type: string # photos are converted to a string in JSON
463             - oneOf:
464               - contentMediaType: image/png
465               - contentMediaType: image/jpg
466             - type: null
467
468
469 ## BACKGROUND PROPERTIES POPULATED AUTOMATICALLY
```

```
470 #=====
471
472 TW Asset Group:
473
474 oneOf:
475   - type: string
476   - type: null
477 invisible: true
478 read-only: true
479 enum:
480   - Drinking Water Network
481   - Drinking Water Treatment Plants
482   - Waste and Storm Water Network
483   - Wastewater Treatment Plants
484   - Independent Building
485   - Multiple Major Systems
486 $comment: |
487   Note that this property is populated automatically, and not available for user
↵ to edit. Use-case: asset from the GIS will not be indexed on the hierarchy. The
↵ main use of this property is to provide a simple handle term, when one needs to
↵ summarize the collection of all assets imported from a certain layer(s) the GIS.
488
489 #####
490 # HIGH LEVEL RULES
491 #####
492
493 rule_spec:
494
495   - name: Asset must have a start of operation date info before we can indicate that
↵ it is operationally available.
496     spec_ID: NyG2nzL5xg
497     type: validation
498     specification: |
499       if both of the following properties are null
500         - (asset_x.properties."first date of City operation")
501         - (asset_x.properties."warranty start date")
502       then the value of (asset_x.properties."operating_state") CANNOT be
↵ "available (up)"
503
504
505   - name: asset can be assigned exclusively to either a role, user, or user group
506     spec_ID: EkD-ZmIceg
507     type: validation
508     specification: |
509       only one of the following properties can have value (i.e., not null) at any
↵ given time. (It is also okay for all of them to be null)
510         - asset_x.properties."assigned_to_role"
511         - asset_x.properties."assigned_to_tool_user"
512         - asset_x.properties."assigned_to_tool_user_group"
513     errorMessage: "Between \"assigned_to_role\", \"assigned_to_tool_user_group\",
↵ \"installed\"assigned_to_tool_user\", every asset may only have one type
↵ assignment."
514
```

```
515
516 - name: consistency between (.properties."operating_state") and assignment values
517   spec_ID: 410Fxr8ceg
518   type: [validation, assertion]
519   specification: |
520     if an asset does not have a value in any of the following properties (i.e.,
↪ all nulls),
521       - asset_x.properties."assigned_to_role"
522       - asset_x.properties."assigned_to_tool_user"
523       - asset_x.properties."assigned_to_tool_user_group"
524     then the value of (asset_x.properties."operating_state") must be "not
↪ assigned work". The opposite must also be true.
525     errorMessage: "An asset NOT assigned to a role, user, or user group should not
↪ be operating and therefore would not have an operating_state"
526
527
528 - name: consistency between asset's physical status and its operating state and
↪ assignments
529   spec_ID: NyG2nzL5xg
530   type: [assertion, validation]
531   specification: |
532     If the value of (asset_x.properties."physical_status") is NEITHER of the
↪ following
533       - "installed"
534       - "in possession"
535     then the following properties would take on the stated values
536       asset_x.properties."operating_state" = "not applicable"
537       asset_x.properties."assigned_to_role" = null
538       asset_x.properties."assigned_to_tool_user" = null
539       asset_x.properties."assigned_to_tool_user_group" = null
540     errorMessage: "If an asset is not \"installed \\ in possession\" (see the
↪ physical_status), then it should not have an operating_state value or any
↪ assignment."
541
542
543 - name: an asset can only be assigned to a discrete asset role
544   spec_ID: 4yBXuH8qle
545   type: [validation]
546   specification: |
547     if (asset_x.properties."assigned_to_role") is NOT null
548       then
↪ (asset_x.properties."assigned_to_role".properties.class.properties."discrete
↪ asset role") = TRUE
549     errorMessage: an asset can only be assigned to a discrete asset role
550
551
552 - name: inheriting the asset location information from its role
553   spec_ID: NJdGTHLqeg
554   type: [assertion]
555   specification: |
556     For an asset, asset_x, if
557     all of the following are true:
558       - asset_x.properties."operating_state" = "installed"
```

```
559         - asset_x.properties."assigned_to_role" is NOT null
560         and one of the following is true
561         - asset_x.properties."assigned_to_role".properties."asset installation
↪ location" is NOT null
562         -
↪ asset_x.properties."assigned_to_role".properties."service_address_or_coordinate"
↪ is NOT null
563         then
564         (asset_x.properties."installation_or_parking_location") would be set to
↪ the value of
565         (asset_x.properties."assigned_to_role".properties."asset installation
↪ location")
566         (asset_x.properties."service_address_or_coordinate") would be set to the
↪ value of
567         (asset_x.properties."assigned_to_role".properties."service_address_or_coordinate")
568
569
570     - name: over-write of manufacturer and model information
571       spec_ID: 01J5RPPEKJCP11NBRW3A4XCKF7
572       specification: |
573         if the value of either
574       status: TBS
575
576
577     - name: a commercially available asset must be associated with manufacturer and
↪ model information
578       spec_ID: 4y3dRfLcee
579       type: validation
580       exempt_grandfather: true
581       specification: |
582         if the value of asset_x.properties.is_a_commercially_available_product is TRUE
583         then NONE of the following properties can be null
584         - asset_x.properties.item_product_master_record
585         - asset_x.properties.manufacturer_name
586         - asset_x.properties.product_model_information
```

02_role.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: role
4  $id:
↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5  type: object
6
7  properties:
8
9    ID:
10
11    type: string
```

```
12   description: Also known as the "tag number" or "entity number" in Avantis's
↪   vocabulary. (Avantis is the a WMS).
13   #[] to do ID for pumping stations an chambers will be from the GIS.
14   rule_spec:
15     - name: ID of Linear Assets Represented as Role in Maximo
16       spec_ID: Vku-67dDxx
17       type: triggered action
18       specification:
19         trigger: replication creation of assetY record from the TWAG
20         action: apply Facility ID from TWAG as ID
21         status: false
22
23   name:
24
25     type: string
26     description: A structured and ideally unique description of the role.
27     const: > #[]
28       ${properties.class.properties."class name"};
29     childOf: ${properties."parent entity".properties."role number"};
30     serving: ${properties."client role served".properties."role number"};
31     # MT []: would you like me to move this into individual roles?
32
33   parent:
34
35     $ref: "../02_role.yml"
36     description: References the role that is served by the larger asset, which
↪   physically subsumes the asset serving this role.
37
38   class:
39
40     $ref: B-entity_class_object_schema/02_role_class.yml
41     description: The class denote the broad types of asset that may play the role
↪   (e.g., "breaker role"), and sometimes, more specifically, it also denotes the
↪   useful function provided by that asset in the role to the larger system (e.g.,
↪   the "tie-breaker role" provides tie-breaking function to the electrical
↪   distribution system).
42
43   class_dependent_specifications:
44
45     type: object
46     description: is a set of properties applicable to the class.
47
48   inferred_classes:
49
50     oneOf:
51     - type: array
52       items:
53         type: string
54     - type: null
55     items:
56       type: string
57     read-only: true
58     description: See the description for inferred classe names(s) made in the
↪   \TWmaximoConfig\1-Schemas\A-entity_record_schema\01_asset_schema.yml
```



```
59   $comment: |
60     See the comment for inferred classe names(s) made in the
↪   \TWmaximoConfig\1-Schemas\A-entity_record_schema\01_asset_schema.yml
61
62   role_status:
63
64     type: string
65     enum:
66       - specified
67       - active
68       - eliminated
69
70     description: |
71       This is the basic life-cycle status of a role. Specified means the role is
↪   conceived and exists in some specification or design documentation. Active means
↪   the necessary supports exist for an asset to serve in the role and function of
↪   the asset being utilized. Eliminated represents a negation of either or both
↪   conditions of the active status.
72
73     rule_spec: |
74       #[]RULE VkiDyJcSxg: Before a role can be eliminated, all children, as well as
↪   the descendants of the role in the hierarchy must also be eliminated.
75       $comment: a procedure should to be created to allow the recursive
↪   elimination of a role and all of its children.
76       #[]RULE VygDCOFrx1: When a role is "eliminated", it must no longer be visible
↪   in any view of the role hierarchy. (Its entire branch must not be available
↪   either, because all of its descendants would be eliminated as well.)
77       []Review with To ASMP: with this rule, we no longer need to have a hierarchy
↪   branched for retired roles.
78       #[]RULE EkP5qy5Sx1: If change auditing cannot be turned on, then when a role
↪   record status is "eliminated", all the specification in the record's datafields
↪   must be frozen.
79
80   role technical requirement description:
81
82     type: string
83     description: A free text description of the role's performance requirements that
↪   must be satisfied by the asset. For example, the lifting capacity in kilograms
↪   for a crane.
84     $comment: |
85       Eventually, this information should be replaced by formalized properties
↪   associated with specific classes. For example, for the motor role class, there
↪   would be a requirement for a minimum amount of horsepower or torque.
86
87   serving_asset_in_role:
88
89     $ref: "../02_role.yml"
90     description: Identifies the asset this role is serving. For example, given a
↪   motor starter role, the value in this data field identifies the role of the
↪   motor controlled by that motor starter.
91
92   asset installation location:
93     oneOf:
```

```
94     - $ref: "../03_space.yml"
95     - type: null
96     description: References the space in which the asset serving the role would be
↪ installed.
97
98     service_address_or_coordinate:
99         oneOf: [$ref: MaximoServiceAddressObject, type: null]
100         description: A geo-coordinate or the nearest street address of the asset.
101
102     #=====
103
104     operator_group:
105
106     inherit operator group value:
107         type: boolean
108         default value: true
109
110     #=====
111
112     inherit_operator_group_from_parent:
113
114         type: boolean
115         default_value: true
116
117     #=====
118
119     maintenance_group:
120
121         oneOf: [$ref: "../04_org_or_group.yml", type: null]
122         description: Group responsible for the preventive and reactive maintenance of
↪ the asset in the role. For example, a unit, work area, or crew.
123
124     #=====
125
126     inherit_maintenance_group_from_parent:
127
128         type: boolean
129         default_value: true
130
131     #=====
132
133     operational criticality:
134
135         oneOf: [$ref: '#/definitions/criticality rating definition', type: null] # see
↪ section 3. LOCAL OBJECT DEFINITION
136         description: A role bears high operational criticality if the loss of the asset
↪ in the role will either reduce throughput or product quality (but not product
↪ safety) of the larger system.
137
138     #=====
139
140     protective function criticality:
141
```

```
142     oneOf: [$ref: '#/definitions/criticalityRatingDef', type: null] # see section 3.
↪ LOCAL OBJECT DEFINITION
143     description: A role bears protective function criticality if the loss of one of
↪ its protective functions (i.e., regulatory/control/protection or containment
↪ function) will either result in a consequential release of hazard or the loss of
↪ a capability to mitigate a greater level hazard.

144
145     #=====
146
147     duplicate record of:
148     oneOf:
149         - type: array
150           items:
151             $ref: "./02_role.yml"
152         - type: null
153
154     #=====
155
156     record retirement information:
157     $ref: "./00_common_definitions.yml#/definitions/record retirement definition"
158
159
160     #=====
161     # [] REMOVE THE FOLLOWING AFTER RULE ABOUT ID IS REVISED
162     # GIS object ID:
163     #   type: string
164     #   description: This is the ID of the equivalent object (asset or role) in GIS.
↪ This value suggests the original record was created in GIS and copied to WMS
↪ through the data integration link.

165
166
167
168 #####
169 # 2. DATA INTEGRITY RULES
170 #####
171 allOf:
172     - if:
173         oneOf:
174             - roleClass:
175                 properties:
176                     className:
177                         const: pumping station
178             - roleClass:
179                 properties:
180                     className:
181                         const: water treatment plant
182             - roleClass:
183                 properties:
184                     className:
185                         const: large chamber
186         then:
187             required: GIS object ID
188
```

```
189 #[] RULE:
190 # IN COMMON LANGUAGE: At any given time, each role may only have a single asset
↪ assigned to it (i.e., associated with the role via the asset's
↪ "assigned_to_role" property).
191
192 #####
193 # 3. LOCAL OBJECT DEFINITION
194 #####
195
196 definitions:
197   criticality rating definition:
198     type: object
199     properties:
200       rating:
201         type: integer
202       description:
203         type: string
204     enum:
205       - rating: 1
206         description: TBD
207       - rating: 2
208         description: TBD
209       - rating: 3
210         description: TBD
211       - rating: 4
212         description: TBD
213       - rating: 5
214         description: TBD
215
216 $comment: |
217   OPEN AND TODO ITEMS:
218   [x] To have discussion on what we put in for criticality
219   [] explicitly specify an unoccupied role
220   [] expression of role equivalence
221   [] RULE: certain GIS assets, such as pumping stations, or treatment facilities
↪ must be mapped over as roles
```

03_space.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: space
4 $id:
↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5 type: object
6
7 properties:
8
9   ID:
10
11     type: string
```

```
12   description: An unique ID
13   $comment: In the future, this value should be validated with a regular
↪   expression.
14
15   parent:
16
17     $ref: "../03_space.yml"
18     description: The larger space that completely contains this space.
19
20   name:
21
22     type: string
23     description: Short name. Should be one that is commonly use by staff in
↪     communication. For example, "boardroom"
24
25   complete_name:
26
27     type: string
28     read-only: true
29     rule_spec:
30       - spec_ID:
31           name: complete name generation
32           id: 01JFVNSOYDFD7K5DP4NVMSKTY8
33           status:
34     $comment: |
35       Automatically generated by the system and not editable. The value is name to
↪       that of its parent, its grandparent ... all the way up that facility space.
36
37
38   enclosed_by_asset:
39
40     oneOf: [$ref: "../01_asset.yml", type: null]
41     description: indicates that the space is what is enclosed by (and immediately
↪     surrounding) the asset, such as a
42       - building,
43       - structural tank,
44       - equipment cabinet,
45       - vehicle
46
47   class:
48
49     $ref: spaceClassObject
50     $comment: |
51       see space_classification.md file
52
53   class_dependent_specifications:
54
55     type: object
56     description: is a set of properties applicable to the class.
57
58   inferred_classes:
59
60     oneOf:
```

```
61     - type: array
62       items:
63         type: string
64     - type: null
65   read-only: TRUE
66   $comment: |
67     See the comment for inferred class name(s) made in the
↪ \TWmaximoConfig\1-Schemas\A-entity_record_schema\01_asset_schema.yml
68
69   #[]REQ 41Vru1Rrxe: This data field should be visible to the users, but should
↪ not be editable by the user
70
71   service_address_or_coordinate:
72     oneOf: [$ref: .IBM_Maximo_object/MaximoServiceAddressObject, type: null]
73     $comment: this is referencing Maximo's native service address object
74
75   status:
76
77     type: string
78     enum:
79       - specified
80       - realized
81       - eliminated
82     $comment: |
83       This field allows the user to specify whether the space is merely specified,
↪ or whether the boundary enclosing the space have been constructed (or
↪ alternatively, the fiat property / or area boundary around is formally
↪ established and approved.) - i.e. "exists".
84       Note that an "eliminated" space should be removed from the hierarchy, and
↪ should not be visible for users conducting maintenance, reliability, planning
↪ and scheduling functions.
85       The term "eliminated" is chosen to indicate that space disappear by the fact
↪ that object bound or defined the space, such as wall, ceilings, or property
↪ lines are removed.
86
87   confined_space:
88
89     type: boolean
90
91   inherit_hazardous_property_values:
92
93     type: boolean
94     default_value: true
95
96   hazardous_location_class:
97
98     type: string
99     enum:
100       - I
101       - II
102       - III
103
104   hazardous_location_division:
```

```
105
106   type: string
107   enum:
108     - 1
109     - 2
110
111   hazardous location group:
112
113     type: string
114     enum:
115       - A
116       - B
117       - C
118       - D
119       - E
120       - F
121       - G
122
123
124   duplicate record of:
125
126     oneOf:
127       - type: array
128         items:
129           $ref: "./03_space.yml"
130       - type: null
131
132   record retirement information:
133     $ref: "./00_common_definitions.yml#/definitions/record retirement definition"
134
```

04_org_objects_definitions.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: organization
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
6  type: object
7  properties:
8
9    organization_or_group_name:
10
11     type: string
12
13   parent_organization:
14
15     oneOf:
16       - $ref: "./04_org_or_group.yml"
17       - type: null
```

```
18 class:
19
20   $ref: B-entity_class_object_schema/04_org_class.yml
21
22 class_dependent_specifications:
23
24   type: object
25   description: is a set of properties applicable to the class.
26
27 leader:
28
29   oneOf:
30     - $ref: "./07_person.yml"
31     - type: null
32   description:
33
34 equivalent_to_Maximo_site:
35
36   description: indicates that this organization maps to a particular site (a
↪   native Maximo object)
37   $ref: MaximoSiteObject
38
39 equivalent_to_Maximo_org:
40
41   description: indicates that this organization maps to a particular organization
↪   (a native Maximo object)
42   $ref: MaximoOrgObject
43
44 duplicate record of:
45
46   oneOf:
47     - type: array
48       items:
49         $ref: "./04_org_or_group.yml"
50     - type: null
51
52 record retirement information:
53
54   $ref: "./00_common_definitions.yml#/definitions/record retirement definition"
55
56 supervisor_group:
57
58 crew:
59
60
```

05_item_master.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: item master
```



```
4 $id:
  ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5 type: object
6
7 properties:
8
9   number:
10
11     type: string
12     description:
13       A read-only UUID, generated by the system, to uniquely identify the item.
14     $comment: |
15       UUID instead of a simple serial used with the consideration that we may in the
  ↪ future incorporate items defined outside of TW.
16
17     #=====
18
19     name:
20
21       type: string
22       description: The human readable short description of the item.
23
24       rule_spec:
25
26         - name: item master record naming
27           form: long
28           spec_ID: VkYgCtRPlx
29           type: assertion
30           specification: |
31             if (item_x.properties.commodity_or_commercial_product) = "commodity", then
  ↪
32               the value of item_x.properties.name would be the semi-colon delimited
  ↪ concatenation of the following property values:
33               - properties.class.properties.name
34               - every non-empty class dependent specification values
35               - properties.supplementary_commodity_description
36             elif: (item_x.properties.commodity_or_commercial_product = "commercial
  ↪ product"), then:
37               the value of item_x.properties.name would be the semi-colon delimited
  ↪ concatenation of the following property values:
38               - properties.class.properties.name
39               - properties.product manufacturer company.properties."company name"
40               - properties.model_and_sub-model
41               - properties.version_or_model_year
42               - properties.product configuration code
43             checked on: 2024-08-15
44
45     #=====
46
47   class:
48
49     $ref: "../B-entity_class_object_schema/01_asset_item_tool_class.yml"
50     $comment: is a value from the item classification, which is a superset of the
  ↪ asset class.
```

```
51
52   rule_spec:
53
54     - name: item classification list includes all classes
55       spec_ID: EynXVZ-dxg
56       specification: |
57         Maximo item classification list would include all class instances of
↪ B-entity_class_object_schema/01_asset_item_tool_class_object_schema.yml,
↪ regardless of the values
58         - properties.tool
59         - properties.only used as a part asset
60       status: specified
61       checked_on: 2024-08-15
62
63
64   class_dependent_specifications:
65
66     type: object
67     description: is a set of properties applicable to the class value.
68
69 # INVENTORY MANAGEMENT FLAGS
70 #=====
71
72   stocked_at_TW:
73
74     $ref: "../00_common_definitions.yml#/definitions/stocked_at_TW_def"
75
76   rotating:
77
78     $ref: "../00_common_definitions.yml#/definitions/rotating_property_def"
79
80 #=====
81 # generic and specific definition
82 #=====
83
84   commodity_or_commercial_product:
85
86     type: string
87     description: indicate whether the item master defines an unspecialized commodity
↪ or a specific commercial product.
88     enum:
89       - commodity
90       - commercial product
91
92   supplementary_commodity_description:
93
94     type: string
95     description: supplementary description, in addition to the class value and and
↪ class-dependent specification values, necessary to differentiate a commodity.
96
97 #=====
98 # MANUFACTURER AND MODEL GROUP
99 #=====
```

```
100
101 commercial_product:
102
103   oneOf:
104     - type: null
105     - $ref: "./00_common_definitions.yml#/definitions/manufacturer_and_model_def"
106
107 commercial_product_description:
108
109   oneOf:
110     - type: null
111     - type: string
112       $ref:
113 ↪   "./00_common_definitions.yml#/definitions/plain-text_manufacturer_and_model_def"
114
115   #=====
116
117 instant_of_commodities:
118
119   oneOf:
120     - type: null
121     - $ref: "./05_item_master.yml"
122
123   rule_spec:
124     - description: range of the instant_of_commodities property must be items
125 ↪   whose TW_defined_commodity value is 'true'.
126     form: short
127     spec_ID: 01JF33GVB2DT7K5FJ3SA3P9EP4
128
129   #=====
130
131 same_item_as:
132
133   oneOf:
134     - type: array
135       items:
136         $ref: "./04_item_master.yml"
137     - type: null
138   description: |
139 ↪   Identifies the same commercial product item made by the same manufacturer, but
140 ↪   differing only in item unit format. For example, the 208-litre drum item and the
141 ↪   5-litre bottle item of Penzoil 5W30 Synthetic Lubricant.
142
143   rule_spec:
144
145     - name: Infer Symmetrical Equivalence between Product Items
146       spec_ID: EJCnUukuex
147       type: inference
148       specification: ""
149       status: []
150
151     - name: Range must be a commercial product as well
152       spec_ID: 01JF81079K178X9B4NSG23AA0Z
```

```
149     type: validation
150     specification:
151     status: []
152
153     #=====
154
155     ordering_information:
156
157     oneOf:
158     - type: array
159       items:
160         $ref: "#/definitions/vendor_order_detail"
161     - type: null
162
163     #=====
164
165     issue_unit:
166
167     type: string
168     description: A description of each individual unit issued for work, such as a
↵ can or roll, of the product item, regardless of the ordering unit, such as a box
↵ of 24. For example, "80 ml can" or "27 x 500in. roll".
169     $comment: "To implementer: use the out of the box list from Maximo"
170
171     #=====
172     # LOCAL OBJECT DEFINITIONS
173     #=====
174
175     definitions:
176
177     vendor_order_detail:
178
179     properties:
180
181     vendor:
182
183     $ref: MaximoCompanyObject
184
185     #=====
186
187     order_unit:
188
189     oneOf:
190     - type: null
191     - type: string
192     description: A description of each individual unit of order, such as a can
↵ or roll, of the product item, regardless of the ordering unit, such as a box of
↵ 24. For example, "80 ml can" or "27 x 500in. roll".
193     $comment: |
194       For a commercial product, if there are multiple item unit formats, one
↵ item should be create for each format.
195       To Implementer,
196       Use Maximo's defaults
```

```
197
198     #=====
199
200     vendor_item_number:
201
202         oneOf:
203             - type: string
204             - type: null
205
206     #=====
207
208     unit_cost_in_CAD:
209
210         type: number
211         description: The expected cost of a unit of the item. (This should not be
↪ the cost of a package of multiple units of the item.)
212         $comment: To TW, in the future, this field should contain a running average
↪ of the recent purchase costs, possibly also adjusted for recent inflation.
213
214
215     # 6/25: [] we need to add another field for lead time. This will contribute to the
↪ dynamic calculation of criticality among other uses.
```

06_tool_master.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: tool item master
4  $id:
↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5  type: object
6
7  properties:
8
9      number:
10
11         type: string
12         description:
13             A read-only UUID, generated by the system, to uniquely identify the tool.
14         $comment: |
15             UUID instead of a simple serial used with the consideration that we may in the
↪ future incorporate items defined outside of TW.
16
17     #=====
18
19     name:
20
21         type: string
22         description: The human readable short description of the tool.
23         rule_spec:
24             - name: tool master name
```

```
25     spec_ID: VJpSzGxdxg
26     type: implication
27     specification: |
28         if: toolX.properties."tool master type" = "generic tool"
29         then:
30             toolX.properties."tool name" value is the semi-colon ("; ") delimited
↪ concatenation of the following property values:
31                 - properties.class.properties."class name"
32                 - properties."generic tool application definition"
33             elif: toolX.properties."tool type" = "specific commercial product"
34             then:
35                 toolX.properties."tool name" value is the semi-colon ("; ") delimited
↪ concatenation of the following property values:
36                 - properties."tool master class".properties."class name"
37                 - properties.product manufacturer company.properties."company name"
38                 - properties.model_and_sub-model
39                 - properties.version_or_model_year
40                 - properties.product configuration code
41     status: specified
42
43     #=====
44
45     class:
46
47     $ref: "../B-entity_class_object_schema/01_asset_item_tool_class.yml"
48     description: This is a value from the classification, which is a superset of the
↪ asset class.
49
50     rule_spec:
51         - name: Tool classification list does not include parts non tools
52           spec_ID: ViulHHW0gx
53           specification: |
54               Tool classification list include all class instances of
↪ B-entity_class_object_schema/01_asset_item_tool_class_object_schema.yml, except
↪ ones whose .properties.tool value is FALSE
55           status: specified
56
57     class_dependent_specifications:
58
59     type: object
60     description: is a set of properties applicable to the class.
61
62
63 # INVENTORY MANAGEMENT FLAGS
64 #=====
65
66     rotating:
67
68     $ref: "../00_common_definitions.yml#/definitions/rotating_property_def"
69
70     #=====
71
72     mobile:
```

```
73
74   type: boolean
75   description: An tool that is used beyond a permanent installation; instead, it
↪   is taken from place to place.
76   $comment: |
77     #PROCESS: SET DEFAULT VALUE:
78     At record creation, set value to false.
79     #PROCESS: EVENT-DRIVEN VALUE CHANGE:
80     Upon the event of a properties.class value change;
81     if properties.class.properties."mobile" = true;
82     then set the value to true;
83     else set the value to false.
84
85
86
87 $comment: ASMP does not expect the tool item master to be widely used during the
↪   initial adoption of Maximo - we expect that most tools would initially be
↪   represented as un-stocked.
```

07_service_item_master.yml

1

08_person.yml

```
1 $schema: http://json-schema.org/draft-07/schema#
2 title: Person
3 $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
4 type: object
5
6 properties:
7
8   ID:
9
10    type: string
11    description: Unique identifier for the person
12
13    first_name:
14
15     type: string
16     description: First name of the person
17
18    last_name:
19
20     type: string
21     description: Last name of the person
22
```

```
23 display_name:
24
25   type: string
26   description: Full name displayed (usually a combination of first and last names)
27
28 division:
29
30   type: string
31   description: indicates which City division that the person works for
32
33 unit:
34
35   type: string
36   description: indicates which business-unit that the person works for
37
38 primary_trade:
39
40   type: string
41   description: Primary craft or skill associated with the person
42
43 external_contractor:
44
45   type: boolean
46   description: indicates whether the person is not an employee of the City
47
48 status:
49
50   type: string
51   enum:
52     - ACTIVE
53     - INACTIVE
54   description: Status of the person
55
56 email_address:
57
58   type: string
59   format: email
60   description: Email address of the person
61
62 phone:
63
64   type: string
65   description: Contact phone number of the person
```

09_qualification.yml

```
1 $schema: http://json-schema.org/draft-07/schema#
2 title: Qualification
3 $id:
4   ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5 type: object
```



```
5
6 properties:
7
8   ID:
9     description: is a read-only, unique, and permanent ID, generated by the system.
10    type: string
11    read-only: TRUE
12
13    #=====
14
15    name:
16
17      description: a short name given by the creator of the record.
18      type: string
19
20      #=====
21
22      class:
23
24        type: string
25        enum:
26          - professional license
27          - industry certification
28          - internal certification
29
30        #=====
31
32        issued_by:
33
34          oneOf:
35            - type: null
36            - $ref: "../04_org_or_group.yml"
37
```

10_warranty.yml

```
1 $schema: http://json-schema.org/draft-07/schema#
2 title: Warranty
3 $id:
4   ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5 type: object
6 properties:
7
8   #=====
9
10  ID:
11
12    description: is the unique identifier for the warranty contract
13    type: string
14
```

```
15 #=====
16
17 description:
18
19     description: is a brief summary of the warranty contract
20     type: string
21
22 #=====
23
24 vendor:
25
26     description: identifies the vendor or provider of the warranty
27     $ref: MaximoCompanyObject
28
29 #=====
30
31 warranty_start_date:
32
33     description: is the first day that the warranty becomes effective
34     oneOf:
35         - type: null
36         - type: number
37
38 #=====
39
40 warranty_expiration_date:
41
42     description: is the last effective date of the warranty
43     oneOf:
44         - type: null
45         - type: number
46
47 #=====
48
49 meter:
50
51     description: if applicable, is the meter reading (e.g., mileage) at which the
52 ↪ warranty starts or ends
53     oneOf:
54         - type: number
55         - type: null
56
57 #=====
58
59 covers_labour:
60
61     description: indicates that the vendor is responsible for providing and covering
62 ↪ the cost of labour
63     type: boolean
64
65 #=====
66
67 covers_parts:
```

```
66
67     description: indicates that the vendor is responsible for providing and covering
↪   the cost of parts
68     type: boolean
69
70     #=====
71
72     specific_terms:
73
74         description: are the terms and conditions related to the warranty coverage
75         type: string
76
77     #=====
78
79     covers_roles:
80
81         description: is the list of roles, more specifically, the assets installed in
↪   the roles that are covered by the warranty
82         oneOf:
83             - type: null
84             - type: array
85               items:
86                 $ref: "../02_role.yml"
87
88     #=====
89
90     covers_assets:
91
92         description: is the list of assets that are covered by the warranty
93         oneOf:
94             - type: null
95             - type: array
96               items:
97                 $ref: "../01_asset.yml"
98         $comment: note that any item converted by the warranty should be expressed as a
↪   rotating item (i.e. represented as an asset as well)
99
```

32_job_plan.yml

```
1  ---
2  $schema: http://json-schema.org/draft-07/schema#
3  title: Job Plan
4  $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5  description: |
6      A job plan is the the lowest level of work description to contain the full
↪   planning specifications.
7  type: object
8
9  properties:
```

```
10
11 ID:
12
13   description: is a read-only, unique, and permanent ID, generated by the system,
↪   to identify the job plan record.
14   type: string
15
16   #=====
17
18   name:
19
20     description: is a description of the activity specified in the job plan.
21     type: string
22
23     #=====
24
25   discrete_activity_classification:
26
27     description: indicates the type of activity that specified in the job plan
28     $ref: "../B-entity_class_object_schema/32_discrete_activity_class.yml"
29     $comment: this could also be called the activity classification
30
31
32     #=====
33     # Job Plan Applicability Notes
34     #=====
35
36   specific_to_asset_classes:
37
38     description: identifies the asset classes on which the activity specified in
↪   this job plan can be done.
39     type:
40       oneOf:
41         - type: null
42         - type: array
43           items:
44             $ref: "../B-entity_class_object_schema/01_asset_item_tool_class.yml"
45
46     #=====
47
48   specific_to_role_classes:
49
50     description: identifies the role classes - more specifically, the assets
↪   installed in these roles - for which this job plan is customized.
51     type:
52       oneOf:
53         - type: null
54         - type: array
55           items:
56             $ref: "../B-entity_class_object_schema/02_role_class.yml"
57     $comment: >
58     Examples of a role class include the tie-breaker and effluent turbidity meter
↪   role class.
```

```
59
60 #=====
61
62 specific_to_operational_units:
63
64     description: identifies the Toronto Water site(s), defined as a organization in
↪ this schema, for which the job plan is specifically customized.
65     type:
66         oneOf:
67             - type: null
68             - type: array
69             items:
70                 $ref: "../A-entity_record_schema/04_org_class.yml"
71     $comment: >
72         Examples of operational group include
73         TAB - Ashbridges Bay Wastewater Treatment Plants
74         COL - Waste and Storm Water Collection
75     rule_spec: >
76         - name: job plan's specific_to_operational_units property must be an unit
↪ level organization
77         spec_ID: 01JD2V5X97J1Y45JWDW4SV1FJ4
78         type: [validation]
79         specification: |
80         Given an job plan, JP_x, all values of JP_x.specific_to_operational_units
↪ must be
81             - an organization, and
82             - whose .class = unit (a subclass of Group in the City)
83
84 #=====
85
86 specific_to_roles:
87
88     description: identifies the asset roles for which the job plan is specifically
↪ customized.
89     type:
90         oneOf:
91             - type: null
92             - type: array
93             items:
94                 $ref: "../A-entity_record_schema/02_role.yml"
95
96 #=====
97
98 specific_to_commercial_products:
99
100     description: identifies the the commercial products for which the job plan is
↪ specifically written/customized.
101     type:
102         oneOf:
103             - type: null
104             - type: array
105             items:
106                 $ref: "../A-entity_record_schema/05_item_master.yml"
```

```

107 rule_spec: >
108   - name: Valid Commercial Product Item reference in a Job Plan
109     spec_ID: 01JD2V5X97J1Y45JWDW4SV1FJ4
110     type: [validation]
111     specification: |
112       Given an job plan, JP_x, all values of
↪ JP_x.specific_to_commercial_products must be
113       - a item master record, and
114       - whose .generic_or_specific_product = "specific commercial product"
115
116   #=====
117   # Record Provenance
118   #=====
119
120   is_derived_from:
121
122     description: identifies the job plan from which the present job plan
↪ specification was based on.
123     oneOf:
124       - type: null
125       - $ref: "./32_job_plan.yml"
126     integration: true
127
128   #=====
129
130   failure_codes:
131
132     description: denotes a physical-based failure condition (e.g., shaft
↪ misalignment).
133     oneOf:
134       - type: null
135       - type: array
136         items:
137           $ref: "./00_common_definitions.yml#/definitions/failure_code"
138
139     #=====
140
141   RCM_failure_modes:
142
143     description: identifies the functional failure mode ID, with respect to a
↪ specific asset role, mitigated by the work specified in this job plan.
144     oneOf:
145       - type: null
146       - type: array
147         items:
148           type: string
149     integration: true
150     $comment: >
151       - For the 2026-27 implementation, this data field will start-out as a
↪ free-text. In the future, the value will come from a solution such as OnePM.
152
153   #=====
154   # Procedure

```

```
155 #=====
156
157 work_description:
158
159     description: is a single body of text outlining the sequential steps to complete
160 ↪ the activity
161     type: string
162     $comment: >
163         Example:
164             1) Ensure you have operational approval before performing this task.
165             2) Follow Lock-out and Tag-out process before starting this task.
166             3) Drain the oil from the gearbox.
167             4) Install 25 Litres of UCON 220 ( food grade) oil.
168             5) Remove Lock-out and Tag-out and check operation.
169             6) Inform operations that the task as assigned is completed.
170
171 # =====
172
173 requires_shut_down:
174
175     description:
176
177 #=====
178 # Resource Requirements
179 #=====
180
181 estimated_duration:
182
183     description: is the estimated time to complete the activity in the job plan
184     $ref: "../00_common_definitions.yml#/definitions/frequency_interval_definition"
185
186 #=====
187
188 parts_or_material_requirements:
189
190     description: identifies the parts and material required to complete the work.
191     oneOf:
192         - type: null
193         - type: array
194           items:
195             $ref:
196 ↪ "../00_common_definitions.yml#/definitions/item_requirement_definition"
197
198 #=====
199
200 tool_requirements:
201
202     description: identifies the tools required to complete the work.
203     oneOf:
204         - type: null
205         - type: array
206           items:
207             $ref:
208 ↪ "../00_common_definitions.yml#/definitions/tool_requirements_definition"
```

```

206
207 #=====
208
209 skill_and_trade_requirements:
210
211     description: identifies the trades and qualifications of each trade needed to
↪ complete the work.
212     oneOf:
213     - type: null
214     - type: array
215       items:
216         $ref: "./00_common_definitions.yml#/definitions
↪ trade_requirement_definition"
217
218 #=====
219
220 service_requirements:
221
222     description: identifies (contracted) service needed to complete the work.
223     oneOf:
224     - type: null
225     - type: array
226       items:
227         $ref:
↪ "./00_common_definitions.yml#/definitions/service_requirement_definition"
228
229 #=====
230 # Related Activities
231 #=====
232
233 must_be_preceded_by:
234
235     description: identifies activities (specified in other job plans) that must be
↪ performed in the same work order before the activity specified in this PM can be
↪ performed.
236     oneOf:
237     - type: null
238     - type: array
239       items:
240         $ref: "./32_job_plan.yml"
241
242 must_be_followed_by:
243
244     description: identifies activities (specified in other job plans) that must be
↪ performed in the same work order after the activity specified in this PM can be
↪ performed.
245     oneOf:
246     - type: null
247     - type: array
248       items:
249         $ref: "./32_job_plan.yml"
250
251 #=====

```



```

252 # Work Trigger Condition Notes
253 #=====
254
255 time-based_frequency:
256
257   oneOf:
258     - type: null
259     - $ref:
↪     ".\00_common_definitions.yml#/definitions/frequency_interval_definition"
260
261   #=====
262
263 meter-based_frequency:
264
265   oneOf:
266     - type: null
267     - $ref: ".\00_common_definitions.yml#/definitions/meter_condition_definition"
268
269   #=====
270
271 description_of_event-based_trigger:
272
273   oneOf:
274     - type: null
275     - type: object
276       properties:
277
278         relation_to_event:
279
280           type: string
281           enum:
282             - before
283             - during
284             - after
285             - at the start of
286             - at the end of
287
288         description_of_event:
289
290           description: a free-text description of a event or process, such as "an
↪           elevator failure".
291           type: string
292
293   #=====
294
295 notes_on_trigger_condition:
296
297   description: free-text description on the additional trigger conditions
298   oneOf:
299     - type: null
300     - type: string
301
302   #=====

```

```
303 # Compliance Information
304 #=====
305
306 compliance_requirement:
307
308     description: identifies the compliance requirement object
309     integration: true
310     oneOf:
311         - type: null
312         - type: array
313         items:
314             $ref: "./00_common_definitions.yml#/definitions/compliance_requirement"
315
316 #=====
317
318 compliance_class:
319
320     description: indicates the level of compliance, with legislative being the top
321     ↪ class
322     $ref: "./00_common_definitions.yml#/definitions/compliance_class"
323
324 #=====
325
326 mitigates_safety_risk_to_staff:
327
328     oneOf:
329         - type: null
330         - type: string
331     enum:
332         - yes
333         - no
334         - unspecified
335
336 #=====
337
338 mitigates_safety_or_health_risk_to_public:
339
340     oneOf:
341         - type: null
342         - type: string
343     enum:
344         - yes
345         - no
346         - unspecified
347
348 #=====
349
350 mitigates_environmental_risk:
351
352     oneOf:
353         - type: null
354         - type: string
355     enum:
```

```
355     - yes
356     - no
357     - unspecified
358
359     #=====
360
361     safe_work_plan_link:
362
363         description: identifies a safety work plan by a permanent URL to the document
↪      (e.g., corporate Safe Procedure or Toronto Water Safe Operating Procedures)
364     oneOf:
365         - type: null
366         - type: array
367           items: #URL strings
368             type: string
369
370     #=====
371     # Require Information Data Submission Group
372     #=====
```

33_PM.yml

```
1  ---
2  $schema: http://json-schema.org/draft-07/schema#
3  title: PM
4  $id:
↪    https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
5  type: object
6
7  properties:
8
9      ID:
10
11      description: is a read-only, unique, and permanent ID, generated by the system,
↪    to identify PM.
12      type: string
13      $comment: This ID is useful for referencing, even when its name changes.
14
15      # =====
16
17      name:
18
19      description: a short name for the PM, given by the creator of the PM.
20      type: string
21
22      # =====
23
24      operational_unit:
25
26      description: indicates Toronto Water's operational unit, on the organizational
↪    hierarchy, such as Waste and Storm Water Pumping (symbol - WASP) or Humber
↪    Wastewater Treatment Plant (symbol - THR).
```

```
27     $ref: "./04_org_or_group.yml"
28
29     # =====
30
31     supervisor_group:
32
33         description: indicates a sub-group of the operational unit, that is led by a
↪ supervisor who is accountable for the performance of the specified work.
34         $ref: "./04_org_or_group.yml"
35
36     # =====
37
38     crew_assignment:
39
40         description: identifies a crew, under the supervisor group, that is always
↪ assigned to perform the specified work
41
42         oneOf:
43             - type: null
44             - $ref: "./04_org_or_group.yml"
45
46         comment: This value will be determined by (and must be consistent with) the
↪ maintainer_organization value - situated at a lower level of the organization
↪ hierarchy
47
48     # =====
49
50     member_of_PM_set:
51
52         description: indicates that this PM is a member of a set of related PMs. For
↪ example, the PMs for raw water pump 1, 2, 3 are all members of a PM set named
↪ Raw Water 5-year Disassembly Maintenance.
53
54         oneOf:
55             - type: null
56             - $ref: "#/definitions/PM_set"
57         rule to add []: only applicable to higher-level PM
58
59     # =====
60
61     Avantis_PM:
62
63         description: indicate the Avantis PM (the legacy WMS) that this Maximo PM
↪ (equivalent to an Avantis PM task) was a part of.
64
65         oneOf:
66             - type: null
67             - type: string
68         read-only: TRUE
69
70         comment: This field can be eliminated in the future.
71
72         work_entity_harmonization: WR(x), WO(x), JP(x)
```

```
73
74 # =====
75
76 processes_covered_by_PM:
77
78     description: a list of all major process systems covered by the work specified
↪   in this PM.
79     read-only: TRUE
80     oneOf:
81         - type: null
82         - type: object
83           properties:
84
85             ranking:
86               type: number
87
88             system_naming:
89               type: string
90
91     rule to add []: only applicable to higher-level PM
92
93
94
95 # Work Specification at a High-level
96 #=====
97
98 role_to_work_on:
99
100     description: indicates role at which the specified must be performed.
101     oneOf:
102         - type: null
103         - $ref: "../A-entity_record_schema/02_role.yml"
104
105 #=====
106
107 asset:
108
109     description: indicates the asset that is being maintained.
110     oneOf:
111         - type: null
112         - $ref: "../A-entity_record_schema/01_asset.yml"
113
114 # =====
115
116 job_plan:
117
118     description: specifies the job plan for the PM, if there is no further
↪   specification within the route.
119
120
121 # PM Structure Specification
122 #=====
123
```

```
124 parent:
125
126   description: indicates the more comprehensive PM, usually a shut-down PM, that
↪   this PM is a part of.
127
128   oneOf:
129     - type: null
130     - $ref: "../A-entity_record_schema/33_PM.yml"
131
132   $comment: PMs should be organized into a PM-set when they are meant to be
↪   performed at different times. For example the PMs for substation line 1 and
↪   line 2 maintenance are performed on alternating years. They can be organize into
↪   a PM-Set named Main Substation Maintenance. PMs should be organized under a
↪   parent PM if they are parts of the same larger continuous process - represented
↪   by the parent - such as the winter shutdown maintenance of island treatment
↪   plant.
133
134
135   # =====
136
137   route:
138
139     description: a sequential list of work, composed of job plans paired with an
↪     asset/role.
140     oneOf:
141       - type: null
142       - type: object
143         properties:
144
145           sequence:
146             type: number
147
148           asset:
149             oneOf:
150               - type: null
151               - $ref: "../01_asset.yml"
152
153           role:
154             oneOf:
155               - type: null
156               - $ref: "../02_role.yml"
157
158           job_plan:
159             oneOf:
160               - type: null
161               - $ref: "../32_job_plan.yml"
162
163     $comment: the implementation could be done with Maximo route object.
164
165     #=====
166     # Resources
167     #-----
168     # Note: Travel time and preparation time are not being recorded explicitly on the
↪     PM. Instead they could be recorded as contributory work in the job plan route
```

```

169  #=====
170
171  estimated_duration:
172
173      description: is the estimated time to complete the activity in the job plan
174      $ref: "./00_common_definitions.yml#/definitions/frequency_interval_definition"
175
176  #=====
177
178  parts_or_material_requirements:
179
180      description: identifies the parts or material required to complete a work order
181      ↪ generated from the PM.
182      oneOf:
183          - type: null
184          - type: array
185            items:
186              $ref:
187                ↪ "./00_common_definitions.yml#/definitions/item_requirement_definition"
188
189  #=====
190
191  tool_requirements:
192
193      description: identifies the tools required to complete a work order generated
194      ↪ from the PM.
195      oneOf:
196          - type: null
197          - type: array
198            items:
199              $ref:
200                ↪ "./00_common_definitions.yml#/definitions/tool_requirements_definition"
201
202  #=====
203
204  skill_and_trade_requirements:
205
206      description: identifies the trades and qualifications of each trade needed to
207      ↪ complete the work.
208      oneOf:
209          - type: null
210          - type: array
211            items:
212              $ref: "./00_common_definitions.yml#/definitions
213      ↪ trade_requirement_definition"
214
215  #=====
216
217  service_requirements:
218
219      description: identifies (contracted) service needed to complete to complete a
220      ↪ work order generated from the PM.

```

```

215     oneOf:
216       - type: null
217       - type: array
218         items:
219           $ref:
↵ " ./00_common_definitions.yml#/definitions/service_requirement_definition"
220
221
222     #=====
223     # Work Triggering Specification
224     #-----
225     # Note: the specification is not complete for data mapping purposes, it is
↵ complete for requirement gather
226     #=====
227
228     next_due_date_based_on:
229
230       type: string
231       enum:
232         - work start date
233         - work completion date
234
235     trigger_condition: # aka work generation condition
236
237     oneOf:
238       - type: null
239       - $ref: "#/definitions/time-based_trigger_specification"
240       - $ref: "#/definitions/meter-based_trigger_specification"
241
242
243     #=====
244     # Legislative Designation
245     #=====
246
247     compliance_level:
248
249       $ref: " ./00_common_definitions.yml#/definitions/compliance_class"
250
251     work_entity_harmonization: WR(x), WO(_), JP(_)
252
253     #####
254     # LOCAL OBJECT DEFINITIONS
255     #####
256
257     definitions:
258
259     time-based_trigger_specification:
260
261       next_due_date:
262         type: number
263
264       frequency_interval:
265         $ref: " ./00_common_definitions.yml#/definitions/frequency_interval_definition"

```



```
266
267 #=====
268
269 meter-based_trigger_specification:
270
271   next_meter_reading:
272     type: number
273
274   meter_condition:
275     oneOf:
276       - type: null
277       - $ref:
↪    "./00_common_definitions.yml#/definitions/meter_condition_definition"
278
```

34_FR_WR_WO.yml

```
1 $schema: http://json-schema.org/draft-07/schema#
2 title: Failure Report, Work Request, Work Order
3 $id:
↪  https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/A-entity_record_sc
4
5 $comment: In this design, the work request doubles as a failure report.
6
7 properties:
8
9   #=====
10   # RECORD
11   #=====
12
13   ID:
14   #-----
15   description: is a read-only unique ID, generated by the system, to uniquely
↪   identify the record.
16   type: string
17
18   implementation:
19     MX_mapping: WONUM
20
21   311_ticket_ID:
22   #-----
23   implementation:
24     MX_mapping: COTTICKETID
25     D&C_only: true
26
27   311_request_number:
28   #-----
29   implementation:
30     MX_mapping:
31     D&C_only: true
32
```

```

33     $comment: |
34         [] to resolve: there is some uncertainty of this should be either
↪ COTREQUESTNUMBER or EXTERNALREFID
35
36 record_type:
37 #-----
38     description: indicates whether this work request is being used to track an
↪ failure, without being a request for work to address the failure.
39     type: string
40     enum:
41         - failure report
42         - work request
43         - work order
44
45     rule_spec:
46         - name: inference of current_type from status
47         status: []
48
49 status:
50 #-----
51     description: indicate the status of failure report, work request, and work order
52     type: string
53     enum:
54         - failure reported
55         - request made
56         - request approved
57         - request cancelled
58         - waiting on resource
59         - ready to schedule
60         - scheduled
61         - in progress
62         - completed
63         - closed
64         - WO cancelled
65
66     implementation:
67         MX_mapping: WO.status
68
69 following-up_on:
70 #-----
71     description: identifies the work order which this record is following up on.
72     read-only: true
73     oneOf:
74         - type: null
75         - $ref: "../A-entity_record_schema/35_work_order.yml"
76
77     #=====
78     # THE OBJECT
79     #=====
80
81 role_to_work_on:
82 #-----
83     description: indicates role at which the specified work is to be performed.

```

```

84   oneOf:
85     - type: null
86     - $ref: "../A-entity_record_schema/02_role.yml"
87     [] should have name and description, like asset_to_work_on
88
89   rule_spec:
90     - name: mutual exclusion of asset_to_work_on and role_to_work_on values
91       spec_ID: 01JFK49T43T1TF3HBTBTDPMN5Y
92       form: short
93       specification: |
94         one, but only one, of the following properties can have a non-null value:
95         - role_to_work_on
96         - asset_to_work_on
97
98   asset_to_work_on:
99   #-----
100   description: indicates asset on which the specified work is to be performed.
101   oneOf:
102     - type: null
103     - $ref: "../A-entity_record_schema/01_asset.yml"
104   properties:
105     ID:
106     #-----
107     implementation:
108       MX_mapping: WO.ASSETNUM
109     name:
110     #-----
111
112   implementation:
113     MX_mapping: WO.ASSETNUM
114     $comment: |
115       multiple fields may need to be represented.
116
117   asset_or_role_criticality:
118   #-----
119   description: is the criticality values inherited from the asset or role being
120   ↪ worked on.
121   read-only: true
122   oneOf:
123     - type: null
124     - type: object
125   properties:
126     rating:
127       type: number
128
129     description:
130       type: string
131
132   issue_found_at_address:
133   #-----
134   description: indicates the service address in or around which a failed asset
135   ↪ requiring maintenance is located.

```

```
135
136   oneOf:
137     - type: null
138     - $ref: MaximoServiceAddressObject
139
140   route:
141     #-----
142     description: a sequential list of work, composed of job plans paired with an
143     ↪ asset/role.
144     oneOf:
145       - type: null
146       - type: object
147         properties:
148           sequence:
149             type: number
150
151           asset:
152             oneOf:
153               - type: null
154               - $ref: "./01_asset.yml"
155
156           role:
157             oneOf:
158               - type: null
159               - $ref: "./02_role.yml"
160
161           job_plan:
162             $ref: "./32_job_plan.yml"
163
164     $comment: the implementation could be done with Maximo route object.
165
166     #=====
167     # FAILURE REPORTING
168     #=====
169
170   description_of_issue:
171     #-----
172     description: is a factual description of the observable aspects of a single
173     ↪ issue..
174     type: string
175
176     implementation:
177       WR_only: true
178
179   observed_problems:
180     #-----
181     description: is what's also known as a common symptom code (e.g., making noise,
182     ↪ cannot start, not running).
183     oneOf:
184       - type: null
185       - type: array
186         items:
```

```
185     $ref: "../00_common_definitions.yml#/definitions/failure_code"
186
187   implementation:
188     WR_only: true
189
190   rule_spec:
191     - name: Which problem codes to show
192       spec_ID: 01JFH3ERR08WHJOE4WRK166WRT
193       form: short
194       specification: []
195
196   $comment: multiple values are allowed
197
198   physical_causes:
199     #-----
200     oneOf:
201       - type: null
202       - type: array
203         items:
204           properties:
205             cause_code:
206               description: denotes a physical-based failure condition (e.g., shaft
207 ↪ misalignment).
208               $ref: "../00_common_definitions.yml#/definitions/failure_code"
209               $comment: one failure code per request
210               rule_spec:
211                 - name: Which Cause Codes to Show
212                   spec_ID: 01JFH2F04P28B4EB2HNWA68KN9
213                   form: short
214                   specification: |
215                     - type must be "cause"
216                     - [] more tbd
217                 action_spec:
218                   - name: Creating a New Failure Code
219                     spec_ID: 01JFH2NE68W0NCSBKSYZRA2Z
220                     form: short
221                     specification: User must be able to specify new failure codes,
222               basis_of_selection:
223                 description: indicates how the failure code was derived
224                 type: string
225                 enum:
226                   - actual observation
227                   - educated guess from signs
228     implementation:
229       WR_only: true
230
231   bread_crumb:
232
233   found_asset_offline_due_to_this_failure:
234     #-----
235     description: indicates whether the asset was offline, because of the failure
236     type: boolean
237     implementation:
```

```
237     WR_only: true
238     $comment: if true, failure reporting is required []Rule
239
240     took_asset_offline_due_to_this_failure:
241     #-----
242     description: indicates whether the asset had to be taken offline, because of the
↪ failure
243     type: boolean
244     implementation:
245         WR_only: true
246
247     #=====
248     # WORK DETAIL
249     #=====
250
251     work_title:
252     #-----
253     description: a short text summarizing the work that is being requested or have
↪ been approved to be performed.
254     oneOf:
255         - type: null
256         - type: string
257
258     implementation:
259         MX_mapping: WO.description
260
261     work_specification:
262     #-----
263     description: a sufficiently detailed description of the work being requested for
↪ the approver of the work.
264
265     implementation:
266         MX_mapping: WO.DESCRPTION_LONGDESCRIPTION
267
268     work_priority:
269     #-----
270     description: a synthetic number derived from the condition of the asset function
↪ being maintained (i.e., how close is it to failure), and the importance (or
↪ criticality) of the asset function to the organization's goals.
271
272     implementation:
273         MX_mapping: INTERNALPRIORITY
274
275     job_plan:
276     #-----
277     description: specifies the job plan for the PM, if there is no further
↪ specification within the route.
278
279     oneOf:
280         - type: null
281         - type: object
282         $ref: "../A-entity_record_schema/32_job_plan.yml"
283
```

```
284   action_spec:
285     name: Importing Specifications from a Job Plan
286     form: short
287     id: 01JFVCVT6Q5F62WAHEB001J7SX
288     specification: TBD []
289
290   work_type:
291     #-----
292     description: is the classification at the work order level
293     $ref: "../B-entity_class_object_schema/33_work_type.yml"
294
295     rule_spec:
296       name: Failure Reporting Leads to Investigation or Repair
297       form: short
298       id: 01JFVCZ9Y7G5MWP2G2DADB2G8Z
299       specification: if failure is reported, then work type must either be
↪   investigative or repair
300
301     discrete_activity_classification:
302       #-----
303       description: is a classification often inherited from the job plan specified on
↪   the work order
304       $ref: "../B-entity_class_object_schema/33_work_type.yml"
305       not_on_WR: true
306
307     site:
308       #-----
309       description: indicates Toronto Water's operational unit, on the organizational
↪   hierarchy, such as Waste and Storm Water Pumping (symbol - WASP) or Humber
↪   Wastewater Treatment Plant (symbol - THR).
310       $ref: "../04_org_or_group.yml"
311
312     implementation:
313       $comment: WO.SITEID
314
315   maintenance_group:
316     #-----
317     description: indicates a sub-group of the operational unit, that is led by a
↪   supervisor who is accountable for performing the work.
318     $ref: "../04_org_or_group.yml"
319
320     rule_spec:
321       name: Inherit the maintenance_group value from either the asset or the role
322       spec_ID: 01JFK43CJBC495TB7Y3H3VP172
323       form: very short
324
325   requires_asset_offline:
326     #-----
327     description: indicates the work requires the asset to be offline
328     oneOf:
329       - type: null
330       - type: string
331     enum:
```

```
332     - yes
333     - no
334     - unknown
335
336   rule_spec:
337     - name: Default value of requires_asset_offline is null
338       req_spec_ID: 01JFK2JOHWVWKDK4WWK5RZCXWY
339       form: very short
340
341   #=====
342   # RESPONSIBILITIES AND ASSIGNMENTS
343   #=====
344
345   crew_assignment:
346     #-----
347     description: identifies a crew, under the supervisor group, that is always
348 ↪ assigned to perform the specified work
349
350     oneOf:
351       - type: null
352       - $ref: "../04_org_or_group.yml"
353
354     WO_only: true
355
356     comment: This value will be determined by (and must be consistent with) the
357 ↪ maintainer_organization value - situated at a lower level of the organization
358 ↪ hierarchy
359
360   trades_assignment:
361     #-----
362     description: identifies the individual trades-persons who will be performing the
363 ↪ work order.
364     oneOf:
365       - type: null
366       - type: array
367         items:
368           $ref: "../08_person.yml"
369
370   asset_covered_by_warranty_contract:
371     #-----
372     description: indicates that the asset (or the asset in the role) is currently
373 ↪ covered by a warranty contract.
374     type: boolean
375
376     implementation:
377       MX_mapping: WO.WARRANTYEXIST
378
379     todo []: rule - determine the value from the asset's warranty information.
380
381   warranty_expiration_date:
382     #-----
383     description: indicates the date the warranty expires, if the asset is covered by
384 ↪ a warranty contract.
```



```
379     type: number
380
381     implementation:
382       MX_mapping: WO.WARRANTYEXPDATE
383
384     send_work_to_warranty_contractor:
385       #-----
386       description: a true (or yes) value indicates that the specified work should be
↪ performed by the warranty contractor.
387       type: boolean
388       todo []: rule - enable this field, only if asset_covered_by_warranty_contract is
↪ true
389
390     asset_covered_by_service_contract:
391       #-----
392       description: indicates that the asset (or the asset in the role) is currently
↪ covered by a service contract.
393       type: boolean
394
395     send_work_to_service_contractor:
396       #-----
397       description: a true (or yes) value indicates that the specified work should be
↪ performed by a the selected service contractor.
398       oneOf:
399         - type: null
400         - $ref: "../A-entity_record_schema/07_service_item_master.yml"
401
402     supports_a_capital_project:
403       #-----
404       description: indicate that the specified work supports the work being done be a
↪ capital project consultant or contractor.
405       type: boolean
406
407     supports_the_capital_project:
408       #-----
409       description: indicates the specific capital project (represented as a work
↪ order)
410       oneOf:
411         - type: null
412         - $ref: "../A-entity_record_schema/35_work_order.yml"
413
414     #=====
415     # Resources
416     #=====
417
418     estimated_duration:
419       #-----
420       description: is the estimated time required in hours to complete the activity in
↪ the job plan
421       oneOf:
422         - type: null
423         - type: number
424
```

```

425 part_or_material_requirements:
426 #-----
427   description: identifies the parts or material required to complete a work order
↪   generated from the PM.
428   oneOf:
429     - type: null
430     - type: array
431       items:
432         $ref:
↪   ". /00_common_definitions.yml#/definitions/item_requirement_definition"
433
434 tool_requirements:
435 #-----
436   description: identifies the tools required to complete a work order generated
↪   from the PM.
437   oneOf:
438     - type: null
439     - type: array
440       items:
441         $ref:
↪   ". /00_common_definitions.yml#/definitions/tool_requirements_definition"
442
443 service_requirements:
444 #-----
445   description: identifies (contracted) service needed to complete to complete a
↪   work order generated from the PM.
446   oneOf:
447     - type: null
448     - type: array
449       items:
450         $ref:
↪   ". /00_common_definitions.yml#/definitions/service_requirement_definition"
451
452 skill_and_trade_requirements:
453 #-----
454   description: identifies the trades and qualifications of each trade needed to
↪   complete the work.
455   oneOf:
456     - type: null
457     - type: array
458       items:
459         $ref: ". /00_common_definitions.yml#/definitions
↪   trade_requirement_definition"
460
461 #=====
462 # DATES
463 #=====
464
465 issue_reported_date:
466 #-----
467   description: is the date that the issue or failure was reported.
468   oneOf:
469     - type: null

```

```
470     - type: number
471
472 work_requested_date:
473 #-----
474   description: is the date when the work request was submitted.
475   oneOf:
476     - type: null
477     - type: number
478
479 request_approval_date:
480 #-----
481   description: is the date that the work request was approved (and when it became
↪   a work order).
482   oneOf:
483     - type: null
484     - type: number
485
486 target_start_date:
487 #-----
488   description: is the date when the work should begin (according to a certain
↪   service standard).
489   oneOf:
490     - type: null
491     - type: number
492
493 target_completion_date:
494 #-----
495   description: is the date when the work should be completed (according to a
↪   certain service standard).
496   oneOf:
497     - type: null
498     - type: number
499
500 scheduled_start_date:
501 #-----
502   description: is the date when the work is scheduled (by a scheduler) to begin.
503   oneOf:
504     - type: null
505     - type: number
506
507 scheduled_completion_date:
508 #-----
509   description: is the date when the work is scheduled (by a scheduler) to be
↪   completed.
510   oneOf:
511     - type: null
512     - type: number
513
514 actual_start_date:
515 #-----
516   description: is the date when the work actually began.
517   oneOf:
518     - type: null
```

```

519     - type: number
520
521 actual_completion_date:
522 #-----
523   description: is the date when the work was actually completed.
524   oneOf:
525     - type: null
526     - type: number
527
528 cancel_date:
529 #-----
530   description: is the date when the work was cancelled (and the record became
↪   either a cancelled work order or work request).
531   oneOf:
532     - type: null
533     - type: number
534
535 WO_closing_date:
536 #-----
537   description: is the date when the work order was closed.
538   oneOf:
539     - type: null
540     - type: number
541
542 #=====
543 # Failure Information Inherited
544 #=====
545
546 member_of_PM_set:
547 #-----
548   description: indicates that this PM is a member of a set of related PMs. For
↪   example, the PMs for raw water pump 1, 2, 3 are all members of a PM set named
↪   Raw Water 5-year Disassembly Maintenance.
549
550   oneOf:
551     - type: null
552     - $ref: "#/definitions/PM_set"
553
554 parent_work_order:
555 #-----
556   description: indicates the more comprehensive PM, usually a shut-down PM, that
↪   this PM is a part of.
557   oneOf:
558     - type: null
559     - $ref: "../A-entity_record_schema/33_PM.yml"
560
561 WO_only: true
562
563 rule_spec:
564   name: Work Type of Descendant Work Orders
565   form: short
566   id: 01JFVDM89RVDCE7VBVM7FDQHRD
567   specification: In a work order hierarchy, the top-level work order determines
↪   the work type of all descendant work orders.

```

```
568
569   $comment: |
570     PMs should be organized into a PM-set when they are meant to be performed at
↪   different times. For example the PMs for substation line 1 and line 2
↪   maintenance are performed on alternating years. They can be organize into a
↪   PM-Set named Main Substation Maintenance. PMs should be organized under a parent
↪   PM if they are parts of the same larger continuous process - represented by the
↪   parent - such as the winter shutdown maintenance of island treatment plant.
571
572   summary_of_previous_issue_reports:
573
574     description: presents a summary of previously reported issues and failures
↪   related to this work.
575     oneOf:
576       - type: null
577       - type: object
578         name: compiled_issue_report
579         properties:
580           # -----
581           compiled_text_summary:
582             description: the compilation of all text information in a issue report,
↪   including problem code, failure code, and description.
583             oneOf:
584               - type: null
585               - type: array
586                 items:
587                   - type: string
588             # -----
589           photographs:
590             description: photographs in the failure report.
591             oneOf:
592               - type: null
593               - type: array
594                 items:
595                   - type: string # photos are converted to a string in JSON
596                   - oneOf:
597                     - contentType: image/png
598                     - contentType: image/jpg
599
600   mitigates_safety_risk_to_staff:
601     #-----
602     description: indicates the work has impact on workers' safety
603     oneOf:
604       - type: null
605       - type: string
606     enum:
607       - yes
608       - no
609       - unspecified
610
611   mitigates_safety_or_health_risk_to_public:
612     #-----
613     description: indicates that the work has a direct impact on the well-being of
↪   the public
```

```
614     oneOf:
615     - type: null
616     - type: string
617     enum:
618     - yes
619     - no
620     - unspecified
621
622 mitigates_environmental_risk:
623 #-----
624     description: indicates that the work has impact on environmental protection
625     oneOf:
626     - type: null
627     - type: string
628     enum:
629     - yes
630     - no
631     - unspecified
632
633 #=====
634 # Legislative Designation
635 #=====
636
637 compliance_class:
638 #-----
639     description: indicate that the completion of the specified work would satisfy
640 ↪ some compliance requirement of a certain Level.
641     $ref: "../00_common_definitions.yml#/definitions/compliance_class"
642
643 attachments:
644 #-----
645     description: documents or photographs that provide further supplementary
646 ↪ information.
647     oneOf:
648     - type: null
649     - $ref: "../A-entity_record_schema/35_work_order.yml"
650
651     implementation:
652     MX_mapping:
653
654 #####
655 # MINOR OBJECT DEFINITIONS
656 #####
657
```

36_work_order_documentation.yml

```
1 $schema: http://json-schema.org/draft-07/schema#
2 title: Work Order Documentation
```

```
3 $id:
4   ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/1-Schemas/A-entity_record_schema/
5 type: object
6 properties:
7   work_order_reference:
8
9     description: identifies the work order, whose actual that is being documented.
10    read-only: true
11    $ref: "../A-entity_record_schema/35_work_order.yml"
12
13
14    # OPERATIONAL STATUS INFORMATION
15    #=====
16    # Note: in a work order containing children work orders, these information only
17    ↪ have to be filled in at the parent level.  [] rule
18
19    asset_offline_at_start:
20
21      description: indicates that the asset was offline when the work began
22      type: boolean
23      $comment:
24
25    asset_brought_back_online:
26
27      description: is only applicable if the asset was offline when the work began;
28      ↪ this entry indicates that the work, within the scope of this work order, brought
29      ↪ the asset back online
30      type: boolean
31      $comment:
32
33
34    # ACTUAL WORK ORDER RESOURCE USAGE
35    #=====
36
37    revised_description_of_actual_work:
38
39      description: is a revised and more accurate description of the actual work
40      ↪ performed on the asset.
41      type: string
42
43    actual_start_time:
44
45    actual_completion_time:
46
47    actual_wrench_time:
48
49      description: is the actual time taken to complete the work order.
50      $ref: "../00_common_definitions.yml#/definitions/frequency_interval_definition"
```

```
51 actual_parts_and_material_usage:
52
53   description: identifies the parts and material used in completing the work.
54   oneOf:
55     - type: null
56     - type: array
57       items:
58         $ref:
59 ↪   "./00_common_definitions.yml#/definitions/item_requirement_definition"
60
61 actual_tool_usage:
62
63   description: identifies the tools used to perform the work.
64   oneOf:
65     - type: null
66     - type: array
67       items:
68         $ref:
69 ↪   "./00_common_definitions.yml#/definitions/tool_requirements_definition"
70
71 actual_services_usage:
72
73   description: identifies (contracted) service that was actually needed complete
74 ↪   the work.
75   oneOf:
76     - type: null
77     - type: array
78       items:
79         $ref:
80 ↪   "./00_common_definitions.yml#/definitions/service_requirement_definition"
81
82 actual_trades_involvement:
83
84   description: identifies the trade and qualifications needed to complete the
85 ↪   work.
86   oneOf:
87     - type: null
88     - type: array
89       items:
90         $ref:
91 ↪   "./00_common_definitions.yml#/definitions/trade_requirement_definition"
92
93 # CHILDREN WORK-ORDER DOCUMENTATION
94 #=====
95 # The user is able to account for additional work done, by adding new
96 ↪ children_work_documentation items. These items would refer any work order.  []
97 ↪ todo: need to define a procedure for creating a new work documentation.
98
99 children_work_documentations:
```



```
96
97   description:
98   oneOf:
99     - type: null
100     - type: array
101       items:
102         $ref: "../A-entity_record_schema/36_work_documentation.yml"
103
104
105   # FAILURE REPORTS AND FOLLOWUP REQUESTS
106   #=====
107   # Note: the failures are reported on follow-up work requests. The linkage between
↪   a followup work order and work order documentation is found on the work order
↪   schema
```

41_meter.yml

```
1  $schema: "http://json-schema.org/draft-07/schema#"
2  title: Meter
3  $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/A-entity_record_schema/41_me
4
5  properties:
6
7
```

Folder: B-entity_class_object_schema

01_asset_item_tool_class.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset item class
4  $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/B-entity_class_obj
5  type: object
6
7  #####
8  # 1. Properties
9  #####
10
11  properties:
12
13    allOf:
14      - $ref:
↪        "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
15      #inherit the defintions and rules from th
↪        "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
```

```
16
17 #=====
18 parent class:
19   $ref: B-entity_class_object_schema/01_asset_item_tool_class_object_schema.yml
20
21 #=====
22 only used as a part:
23   oneOf:
24     - type: boolean
25     - type: null
26   description: A true value indicates that all instances of this class is always
↪   used as a part of another asset, and would never be given an asset tag. E.g.,
↪   bearing.
27   rule_spec:
28     - name: Do not include only used as a part in the asset classification
29       spec_ID: NJ1E1ZbOgg
30       status: TBS
31   $comment: A false or null value materially mean the same thing.
32
33
34
```

02_role_class.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: role classification object
4 $spec_ID: B-entity_class_object_schema/02_role_class.yml
5 type: object
6
7 #####
8 # 1. Properties
9 #####
10
11 properties:
12
13   allOf:
14     - $ref:
↪     "1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
15       #inherit the defintions and rules from th
↪     "1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
16
17   parent class:
18     $ref: B-entity_class_object_schema/02_role_class.yml
19     sort order: 1-30
20
21   discrete asset role:
22     oneOf: [type: boolean, type: null]
23     read-only: true
24     description: a role that can be occupied by a single discrete asset.
25
```

```
26 functional structure role:
27   oneOf: [type: boolean, type: null]
28   read-only: true
29   description: a role that cannot be occupied any discrete asset, but can be the
↪   parent to other roles.
30
31 defined set of roles:
32   oneOf: [type: boolean, type: null]
33   read-only: true
34   description: a role that can be occupied by a collection of discrete assets.
35
36 compatible asset occupant class(s):
37   oneOf:
38     - type: array
39       items:
40         $ref: "./01_asset.yml"
41     - type: null
42   $comment: |
43     [ ]RULE NJQ6BwsVee: A asset must be an instance of one of classes listed in
↪     this field to be allowed to occupy a role under this class.
44
45 #####
46 # 2. High level rules
47 #####
48
49 rule_spec:
50   - name: Is an asset role, functional structure role, or defined set of roles
↪
51     spec_ID: NyD4XGbuex
52     specification: |
53       if roleClassX is a decendent of "Discrete Asset Role" in the role
↪     classification hierarchy:
54         set roleClassX.properties."a discrete asset role" to TRUE
55         set roleClassX.properties."a functional structure role" to FALSE
56         set roleClassX.properties."a defined ser of role" to FALSE
57       elif roleClassX is a decendent of "functional structure role" in the role
↪     classification hierarchy:
58         set roleClassX.properties."a discrete asset role" to FALSE
59         set roleClassX.properties."a functional structure role" to TRUE
60         set roleClassX.properties."a defined ser of role" to FALSE
61       elif roleClassX is a decendent of "Defined Set of Roles" in the role
↪     classification hierarchy:
62         set roleClassX.properties."a discrete asset role" to FALSE
63         set roleClassX.properties."a functional structure role" to FALSE
64         set roleClassX.properties."a defined ser of role" to TRUE
65     status: specified
```

03_space_class.yml

```
1 title: role classification object
2 $id: spaceClassObject
```

```
3 $schema: "http://json-schema.org/draft-07/schema#"
4 type: object
5
6 properties:
7
8   allOf:
9     - $ref:
10       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
11       #inherit the defintions and rules from th
12       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
13
14   parent class:
15     $ref: spaceClassObject
```

04_org_class.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: role classification object
4 $id: orgGroupClassObject
5 type: object
6
7 properties:
8
9   allOf:
10     - $ref:
11       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
12       #inherit the definitions and rules from th
13       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
14
15   parent class:
16     $ref: orgGroupClassObject
```

08_trade_type.yml

```
1
```

101_common_class_definitions.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: generic class object
4 $id:
5   ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/1-Schemas/B-entity_class_obj
6 type: object
```

```

6
7 # This set of properties are used in all classification objects (e.g., asset,
  ↳ organization, etc.)
8
9 properties:
10
11 #=====
12
13 class name:
14   type: string
15   description: a noun or short noun-phrase name of the class
16
17 #=====
18
19 class name with synonym(s):
20   oneOf:
21     - type: null
22     - type: array
23       items:
24         type: string
25   description: other synonymous names that may be used by a user in search
26
27 #=====
28
29 class definition:
30   oneOf:
31     - type: null
32     - type: string
33
34 #=====
35
36 applicable to individual:
37   type: boolean
38   $comment: |
39     a "FALSE" value indicates that the class is meant to be a structural part of
  ↳ the classification tree, and cannot be used to classify any entity (i.e. asset,
  ↳ role, space, etc).
40   #=====
41
42 retired:
43   type: boolean
44   rule_spec:
45     - name: rules on retire classes
46       spec_ID: Vy3qYEZ_ex
47       type: [UI]
48       specification: |
49         a retired class should not appear in the list of classes for user
  ↳ selection. Also, the value of its properties."applicable to individual" must be
  ↳ FALSE.
50     status: draft

```

32_discrete_activity_class.yml

```
1 ---
2 title: discrete activity classification object
3 $id: discreteActivityClassObject
4 $schema: "http://json-schema.org/draft-07/schema#"
5 type: object
6
7 properties:
8
9   allOf:
10     - $ref:
11       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
12       #inherit the defintions and rules from th
13       ↪ "/1-Schemas/B-entity_class_object_schema/00_common_class_definitions.yml"
14
15   parent class:
16     $ref: discreteActivityClassObject
```

33_work_type.yml

```
1 title: work type object
2 $id: workOrderClassObject
3 $schema: 'http://json-schema.org/draft-07/schema'
4 type: object
```

Folder: 2-Classification_Trees

01_asset_classification.md

```
1 > **Important Note:**
2 >
3 > **This file is no longer being maintained**. The information had been ported to an
4 ↪ ontology file for further development and editing. You can find the file at
5 ↪ https://github.com/TW-ASMP/TWONTO/blob/main/OWL/TWONTO.ofn
6 >
7 > To view the hierarchy, save it to you computer, and open it with the desktop
8 ↪ version of [Stanford Protege] (https://protege.stanford.edu/software.php).
```

02_role_classification.md

```
1 ## Top-Level Role Classification
2
3 * Discrete Asset Role*
```

```
4      * generator role
5          * backup generator role
6          * emergency generator role
7      * breaker role
8          * bus feeder breaker role
9          * line protection breaker role
10         * load breaker role
11         * tie-breaker role
12 * Collection of Assets Role*
13     * functional structure role
14         * system block
15         * facility
16             * pumping station
17             * water treatment facility
18             * wastewater treatment facility
19             * lab
20             * yard
21     * process
22 * Linear Functional Structure Role*
23     * system train role
24     * line role
25         * simple line role
26         * primary path line role
27     * junction role
28 * Defined Set of Roles*
29     * defined set of discrete assets
30     * defined set of functional structures
31
32
33 ## Requirements for Implementer
34
35 * []REQ Nyh7RPjEgl #IMP "classes names specified in title-case and with an asterik
  ↳ symbol shall have the appliable to individual property, found in the class
  ↳ object, set to false"
36
37 ## Notes
38
39 * []TODO #TW: the following should be moved to the asset classification.
40     * system on a skid
41     * system of standardized modular parts
```

03_space_classification.md

```
1 ## Top-Level Space Classification and Examples
2
3 * Discrete Space*
4     * building or structure interior
5     * room interior
6     * corridor
7     * mezzanine
8     * stairwell
```

```
9      * stairwell segment
10     * tunnel interior
11     * equipment cabinet interior
12     * storage cabinet interior
13     * facility site space
14     * facility site section
15     * building or structure exterior
16     * vehicle interior
17 * Collection of Spaces*
18     * spaces of a building or structure [^1]
19     * define set of spaces
20
21 ## Requirements for Implementer
22
23 []REQ Nyh7RPjEgl #IMP "classes names specified in camel-case and with an asterik
  ↳ symbol shall have the appliable to individual property, found in the class
  ↳ object, set to false"
24
25 ## Notes
26 ### Footnotes
27 [^1]: a collection of indoor and outdoor spaces inside and around a structure.
  ↳ []TODO #TW "add to the TWONTO".
```

04_org_classification.md

```
1 ## Top-Level Org/Group Classification
2
3 * Level of Government*
4     * provincial government
5     * regional government
6     * municipal government
7 * Group in the City*
8     * cluster
9     * division
10    * section
11    * unit
12    * Group in TW*
13        * work area
14        * crew
15 * government agency
16 * private business
17 * non-governmental organization
18
19 ## Requirements for Implementer
20
21 []REQ Nyh7RPjEgl #IMP "classes names with an asterik symbol shall have the appliable
  ↳ to individual property, found in the class object, set to false"
```


31_work_type.md

```
1  ## Work Type [^2]
2
3  * corrective / repair
4  * emergency [^1]
5  * investigative
6  * preventive
7  * asset data
8  * project
9    * contractor support
10
11 ## Notes
12 [^1]: An emergency work order is technically a corrective work that must be done
    ↪ urgently; may also involve an investigative component (not unlike other
    ↪ corrective work orders).
13 [^2]: The commissioning work type has been removed from this list but retained in
    ↪ the discrete activity classification.
```

32_discrete_activity_classification.md

```
1  ## Top-Level Discrete Activity Classification
2  * Condition Evaluation*
3    * quick check
4    * inspection and evaluation
5    * test and analysis
6    * condition analysis
7  * sample collection
8  * cause investigation
9  * repair or service [^1]
10    * calibration
11    * asset replacement
12    * asset part replacement
13    * asset part movement
14  * Move or Replace*
15    * new asset installation
16    * asset movement
17    * asset part movement
18    * asset replacement
19    * asset part replacement
20    * asset hand-over
21  * Life Cycle Events*
22    * asset commissioning
23    * asset hand-over [^3]
24    * final asset decommissioning
25  * Asset Modification*
26    * modify asset set-point
27    * physical modification to asset
28    * physical modification to building or structure [^2]
29  * asset assignment
```

```
30 * Contributory Work*
31   * item procurement
32   * work coordination
33   * safety preparation
34   * setup
35   * takedown of setup
36   * travel
37 * design or redesign
38   * creation of new role
39   * removal of existing role
40 * Asset Data*
41   * record information correction
42   * record retirement
43
44
45
46 ## Requirements for Implementer
47
48 ```yaml
49 rule_spec:
50   - name: Valid Assignment of an Asset
51     spec_ID: 01JDCNEFAED17CWF2K851ZAJKW
52     type: [assertion]
53     description: |
54       classes names specified with an asterisk symbol shall have the their
55 ↵ .property.appliable_to_individual value set to false
56 ```
57
58 ### Footnotes
59 [^1]: more will be added before the final implementation.
60 [^2]: the physical modification of a building or a structure may result in the
61 ↵ creation and removal of a space, hence it is singled out.
62 [^3]: the process by which a asset's ownership is transferred from a capital project
63 ↵ to Toronto Water.
```

Folder: 3-System_Hierarchies

02_role_hierarchy.md

```
1 # TW Highest Level Hierarchy
2
3 ## The Hierarchy
4 - TW System
5   - Drinking Water Network
6     - Drinking Water Treatment Plants [^1]
7     - Distribution Pumping Stations [^2]
8     - Storage Assets in Drinking Water Supply Network [^3]
9   - Waste and Storm Water Network
10    - Collection Pumping Stations [^4]
```

```
11     - Chambers in Sewer Network
12     - Storages of Wet Whether Flow [^5]
13     - Wastewater Treatment Plants [^6]
14 - Yards
15 - Independent Buildings
16
17 ## The Significance in the Usage of Plurals
18 Where a plural noun is used, for example: Drinking Water Treatment Plants, the
19   ↳ entity represents a set of things. In the case of the example - the set of
20   ↳ drinkin water treatment plants in TW.
21
22 ## Notes
23
24 [^1]: i.e. {[FCL]}, {[FIS]}, {[FHO]}, {[FHA]}
25 [^2]: the set of 18 pumping stations
26 [^3]: the set of all reservoirs and elevated tanks
27 [^4]: pumping station for waste and storm water
28 [^5]: the set of all wet-whether storage, inline an offline.
29 [^6]: i.e. {[THC]}, {[THR]}, {[TAB]}, {[TNT]}
```

03_space_hierarchy.md

```
1 # TW Highest Level Spatial Hierarchy
2
3 ## The Hierarchy
4 - Spaces in TW
5   - Spaces in Drinking Water System
6     - Spaces in Drinking Water Treatment
7     - Spaces in Distribution Pumping Stations
8     - Spaces in Storage of Drinking Water
9   - Spaces in Waste and Storm Water System
10     - Spaces in Collection Pumping Stations
11     - Spaces in Chambers in Sewer Network
12     - Spaces in Storages of Wet Whether Flow
13     - Spaces in Wastewater Treatment Plants
14   - Spaces in Yards
15   - Spaces in Independent Buildings
16
17 ## The Significance in the Usage of Plurals
18 Where a plural noun is used, for example: Spaces in Drinking Water Treatment Plants,
19   ↳ the entity represents a set of things. In the case of the example - the set
20   ↳ spaces within the drinking water treatment plants in TW.
21
22 ## Notes
```

04_org_hierarchy.md

```
1 # Organizations in TW and Interact with TW
2
3 ## The Hierarchy
4
5 * Region of Durham
6 * York Region
7 * Peel Region
8 * Province of Ontario
9 * Metrolinx
10 * TRCA
11 * Envave Energy
12 * City of Toronto
13     * Solid Waste
14     * Toronto Water
15         * Distribution & Collection Section
16             * DOS
17             * WASP
18             * Central Services
19             * Program Maintenance
20         * Water Treatment & Supply Section
21         * Wastewater Treatment Section
22             * Ashbridge's Bay Wastewater Treatment Plant
23             * Highland Creek Wastewater Treatment Plant
24                 * Work Area 1
25                 * Work Area 2
26
27 ## Notes
28 * the portion of this hierarchy under TW is not complete; it will be completed
   ↳ before Phase 3 of implementation is complete.
```

Folder: 4-Class_Dependent_Specifications

README.md

```
1 ## Note
2
3 The Excel file in this folder contains the attribute/property definitions, including
   ↳ data type and value list specs, for a list of asset_classes commonly encountered
   ↳ or bear legislative significance.
4 To view the file, download it to your computer, using the marked option in the image
   ↳ below.
5
6
7 <kbd>
8     
10 </kbd>
```

01_pump.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11    orientation:
12
13      oneOf:
14        - type: null
15        - type: string
16      description: Indicates how the pump is oriented in 3D space
17      enum:
18        - Horizontal
19        - Vertical
20        - Angled
21        - Inverted
22
23      $comment: |
24
25      #=====
26
27    variable_speed:
28
29      oneOf:
30        - type: null
31        - type: boolean
32      description: Indicates the if the pump has variabe speed control
33
34      $comment: |
35
36      #=====
37
38    pump_type:
39
40      oneOf:
41        - type: null
42        - type: string
43      description: Indicates the pump type
44      enum:
45        - "Dynamic, Centrifugal"
46        - "Dynamic, Axial"
47        - "Reciprocating, Piston or Plunger"
48        - "Reciprocating, Diaphram"
49        - "Rotary, Vane"
```

```
50     - "Rotary, Piston"
51     - "Screw Pump"
52     - "Gear Pump"
53
54     $comment: |
55
56     #=====
57
58     max_rpm:
59
60     oneOf:
61         - type: null
62         - type: number
63     description: Indicates the maximum RPM for the pump
64
65     $comment: |
66
67     #=====
68
69     max_flow:
70
71     oneOf:
72         - type: null
73         - type: number
74     description: Indicates the maximum flow rate at the maximum RPM for the pump in
↵ L/s
75
76     $comment: |
77
78     #=====
79
80
81     pump_head:
82
83     oneOf:
84         - type: null
85         - type: number
86     description: Indicates the pressure head for the pump in metres
87
88     $comment: |
89
90     #=====
91
92     submersible:
93
94     oneOf:
95         - type: null
96         - type: boolean
97     description: Indicates if the pump is submersible
98
99     $comment: |
100
101     #=====
```

```
102
103
104 drive_coupling:
105
106   oneOf:
107     - type: null
108     - type: string
109   description: Indicates how the drive and pump are coupled together
110   enum:
111     - "Direct Drive"
112     - "Belt Drive"
113     - "Gear Drive"
114     - "Flexible"
115     - "Chain Drive"
116     - "Hydraulic"
117
118   $comment: |
119
120   #=====
121
122 drive:
123
124   oneOf:
125     - type: null
126     - type: string
127   description: Indicates what the mechanicly drives the pump
128   enum:
129     - "Electric Motor"
130     - "Engine"
131
132   $comment: |
133
134   #=====
135
136 sealed_bearings:
137
138   oneOf:
139     - type: null
140     - type: boolean
141   description: Indicates if the pump has sealed bearings
142
143   $comment: |
144
145   #=====
```

02_motor.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: asset
4 $id:
  ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
```

```
5  type: object
6
7  $comment: >
8
9  properties:
10
11    type:
12
13      oneOf:
14        - type: null
15        - type: string
16      description: Indicates the motor type
17      enum:
18        - "AC"
19        - "AC, Squirrel Cage Induction"
20        - "AC, Wound Rotor Induction"
21        - "AC, Synchronous"
22        - "DC"
23        - "DC, Separately Excited"
24        - "DC, Self Excited"
25        - "DC, Permanent Magnet"
26
27
28    $comment: |
29
30    #=====
31
32
33    voltage:
34
35      oneOf:
36        - type: null
37        - type: number
38      description: Indicates the voltage of the motor in Volts
39
40      $comment: |
41
42      #=====
43
44    horse_power:
45
46      oneOf:
47        - type: null
48        - type: number
49      description: Indicates the horse power of the motor
50
51      $comment: |
52
53      #=====
54
55    nema_frame:
56
57      oneOf:
```



```
58     - type: null
59     - type: string
60   description: Indicates the NEMA frame type for the motor
61   enum:
62     - "42"
63     - "48"
64     - "56"
65     - "66"
66     - "182"
67     - "184"
68     - "213"
69     - "215"
70     - "1412AT"
71     - "143T"
72     - "145T"
73     - "146AT"
74     - "148AT"
75     - "149AT"
76     - "182AT"
77     - "182T"
78     - "184T"
79     - "186ACY"
80     - "186AT"
81     - "189AT"
82     - "203#"
83     - "204#"
84     - "2110AT"
85     - "213T"
86     - "215T"
87     - "219AT"
88     - "224#"
89     - "225#"
90     - "254#"
91     - "254T"
92     - "254U"
93     - "256T"
94     - "256U"
95     - "284#"
96     - "284T"
97     - "284TS"
98     - "284U"
99     - "286T"
100    - "286TS"
101    - "286U"
102    - "324#"
103    - "324T"
104    - "324TS"
105    - "324U"
106    - "326#"
107    - "326T"
108    - "326TS"
109    - "326U"
110    - "364#"
```

```
111     - "364S#"
112     - "364T"
113     - "364TS"
114     - "364U"
115     - "365#"
116     - "365T"
117     - "365TS"
118     - "365U"
119     - "404T"
120     - "404TS"
121     - "404U"
122     - "405T"
123     - "405TS"
124     - "405U"
125     - "444T"
126     - "444TS"
127     - "444U"
128     - "445T"
129     - "445TS"
130     - "445U"
131     - "447T&&"
132     - "447TS&&"
133     - "449T"
134     - "449TS"
135     - "48H"
136     - "56H"
137     - "56HZ"
138     - "L182ACY"
139     - "L186AT"
140
141
142     $comment: |
143
144     #=====
145
146
147     nema_enclosure:
148
149         oneOf:
150             - type: null
151             - type: string
152         description: Indicates what the NEMA enclosure type for the motor
153         enum:
154             - ODP
155             - TEFC
156             - TENV
157             - TEO
158             - TEWD
159             - EXPL
160             - HAZ
161
162
163     $comment: |
```

```
164
165 #=====
166
167 sealed_bearings:
168
169   oneOf:
170     - type: null
171     - type: boolean
172   description: Indicates if the motor has sealed bearings
173
174   $comment: |
175
176 #=====
```

03_valve.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: asset
4 $id:
5   ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6 type: object
7
8 $comment: >
9
10 properties:
11
12   type:
13
14     oneOf:
15       - type: null
16       - type: string
17     description: Indicates the valve type
18     enum:
19       - "Ball"
20       - "Butterfly"
21       - "Cone"
22       - "Diaphragm"
23       - "Gate Valve"
24       - "Globe Valve"
25       - "Knife Valve"
26       - "Needle Valve"
27       - "Pinch Valve"
28       - "Plug Valve"
29
30     $comment: may be redundant to label them valve in the valve type
31
32 #=====
33
34 special_type:
```

```
35   oneOf:
36     - type: null
37     - type: string
38   description: Indicates what type of specialised valve it is if it is a
↪   specialised valve
39   enum:
40     - "Air release valve"
41     - "Backflow Preventer"
42     - "Check"
43     - "Pressure Relief Valve"
44     - "Solenoid"
45
46
47   $comment: may be redundant to label them valve in the valve type
48
49   #=====
50
51   size:
52
53     oneOf:
54       - type: null
55       - type: number
56     description: Indicates the valve size in inches
57
58     $comment: |
59
60     #=====
61
62   ansi_type:
63
64     oneOf:
65       - type: null
66       - type: string
67     description: Indicates the ansi type for the valve
68     enum:
69       - 150
70       - 300
71       - 400
72       - 600
73       - 900
74       - 1500
75       - 2500
76       - 4500
77
78     $comment:
79
80     #=====
81
82   ansi_class:
83
84     oneOf:
85       - type: null
86       - type: string
```

```
87   description: Indicates the ansi class for the valve
88   enum:
89     - "A - Standard"
90     - "B - Special"
91     - "Limited"
92
93   $comment:
94
95   #=====
96
97   horse_power:
98
99     oneOf:
100       - type: null
101       - type: number
102     description: Indicates the horse power of the motor
103
104     $comment: |
105
106     #=====
107
108   nema_frame:
109
110     oneOf:
111       - type: null
112       - type: string
113     description: Indicates the NEMA frame type for the motor
114     enum:
115       - "42"
116       - "48"
117       - "56"
118       - "66"
119       - "182"
120       - "184"
121       - "213"
122       - "215"
123       - "1412AT"
124       - "143T"
125       - "145T"
126       - "146AT"
127       - "148AT"
128       - "149AT"
129       - "182AT"
130       - "182T"
131       - "184T"
132       - "186ACY"
133       - "186AT"
134       - "189AT"
135       - "203#"
136       - "204#"
137       - "2110AT"
138       - "213T"
139       - "215T"
```

```
140     - "219AT"
141     - "224#"
142     - "225#"
143     - "254#"
144     - "254T"
145     - "254U"
146     - "256T"
147     - "256U"
148     - "284#"
149     - "284T"
150     - "284TS"
151     - "284U"
152     - "286T"
153     - "286TS"
154     - "286U"
155     - "324#"
156     - "324T"
157     - "324TS"
158     - "324U"
159     - "326#"
160     - "326T"
161     - "326TS"
162     - "326U"
163     - "364#"
164     - "364S#"
165     - "364T"
166     - "364TS"
167     - "364U"
168     - "365#"
169     - "365T"
170     - "365TS"
171     - "365U"
172     - "404T"
173     - "404TS"
174     - "404U"
175     - "405T"
176     - "405TS"
177     - "405U"
178     - "444T"
179     - "444TS"
180     - "444U"
181     - "445T"
182     - "445TS"
183     - "445U"
184     - "447T&&"
185     - "447TS&&"
186     - "449T"
187     - "449TS"
188     - "48H"
189     - "56H"
190     - "56HZ"
191     - "L182ACY"
192     - "L186AT"
```

```
193
194
195     $comment: |
196
197     #=====
198
199
200     nema_enclosure:
201
202         oneOf:
203             - type: null
204             - type: string
205         description: Indicates what the NEMA enclosure type for the motor
206         enum:
207             - ODP
208             - TEFC
209             - TENV
210             - TEAO
211             - TEWD
212             - EXPL
213             - HAZ
214
215
216     $comment: |
217
218     #=====
219
220     sealed_bearings:
221
222         oneOf:
223             - type: null
224             - type: boolean
225         description: Indicates if the motor has sealed bearings
226
227     $comment: |
228
229     #=====
230
231
232     cwp:
233
234         oneOf:
235             - type: null
236             - type: number
237         description: Indicates the cold working pressure of the valve in psi
238
239     $comment: |
240
241     #=====
242
243
244     nominal_pressure:
245
```

```
246   oneOf:
247     - type: null
248     - type: number
249   description: Indicates the nominal pressure of the valve in psi
250
251   $comment: |
252
253   #=====
254
255   valve_body:
256
257     oneOf:
258       - type: null
259       - type: string
260     description: Indicates the valve body material
261     enum:
262       - "Carbon Steel"
263       - "Stainless Steel"
264       - "Duplex"
265       - "Alloy"
266       - "Composite"
267       - "Titanium"
268
269     $comment: |
270
271     #=====
272
273     actuator_type:
274
275       oneOf:
276         - type: null
277         - type: string
278       description: Indicates the type of actuator
279       enum:
280         - Electric
281         - Pneumatic
282         - Hydraulic
283         - Manual
284
285       $comment: |
286
287       #=====
288
289       stem_seal:
290
291         oneOf:
292           - type: null
293           - type: string
294         description: Indicates the type of stem seal for the valve
295         enum:
296           - "Duplex"
297           - "Lip Seal"
```



```
299     - "O-ring"
300     - "Stuffing Box"
301
302     $comment: |
303
304     #=====
305
306
```

04_breaker.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5  ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6
7  type: object
8
9  $comment: >
10
11  properties:
12
13    type:
14
15      oneOf:
16        - type: null
17        - type: string
18      description: Indicates the breaker type
19      enum:
20        - "Insulated Case"
21        - "Metal Clad or Enclosed"
22        - "Molded Case"
23
24      $comment:
25
26      #=====
27
28      max_voltage:
29
30        oneOf:
31          - type: null
32          - type: number
33        description: Indicates what the maximum continuous voltage rating for the
34        ↪ breaker in Volts
35
36        $comment:
37
38        #=====
39
40      max_amperage:
```

```
39     oneOf:
40       - type: null
41       - type: number
42     description: Indicates what the maximum continuous current rating for the
↪     breaker in Amps
43
44     $comment: |
45
46     #=====
47
48     main_contactor:
49
50     oneOf:
51       - type: null
52       - type: string
53     description: Indicates the ansi type for the valve
54     enum:
55       - "Air Insulated"
56       - "Air Insulated, Air Blast"
57       - "Vacuum Insulated"
58       - "Oil Insultated"
59       - "Gas Insultated"
60
61     $comment:
62
63     #=====
64
```

05_starter.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
5  type: object
6
7  $comment: >
8
9  properties:
10
11     voltage_rating:
12
13     oneOf:
14       - type: null
15       - type: number
16     description: Indicates the continuous voltage rating for the starter in Volts
17
18     $comment:
19
20     #=====
```

```
21
22 current_rating:
23
24   oneOf:
25     - type: null
26     - type: number
27   description: Indicates the continuous current rating for the starter in Amps
28
29   $comment:
30
31   #=====
32
33   vfd_present:
34
35     oneOf:
36       - type: null
37       - type: boolean
38     description: Indicates the presence of a variable frequency drive within the
39 ↪ starter
40
41     $comment:
42
43     #=====
44
45     soft_start_present:
46
47       oneOf:
48         - type: null
49         - type: boolean
50       description: Indicates the function of a soft starter in the starter
51
52       $comment:
53
54       #=====
55
56       main_contactor:
57
58         oneOf:
59           - type: null
60           - type: string
61         description: Indicates the ansi type for the valve
62         enum:
63           - "Air Insulated"
64           - "Air Insulated, Air Blast"
65           - "Vacuum Insulated"
66           - "Oil Insultated"
67           - "Gas Insultated"
68
69         $comment:
70
71         #=====
```

06_transformer.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11    voltage_primary:
12
13      oneOf:
14        - type: null
15        - type: number
16      description: Indicates the primary voltage rating for the transformer in Volts
17
18      $comment:
19
20      #=====
21
22    voltage_secondary:
23
24      oneOf:
25        - type: null
26        - type: number
27      description: Indicates the secondary voltage rating for the transformer in Volts
28
29      $comment:
30
31      #=====
32
33    power_rating:
34
35      oneOf:
36        - type: null
37        - type: number
38      description: Indicates the power rating for the transformer in kVA
39
40      $comment:
41
42      #=====
43
44    oil_filled:
45
46      oneOf:
47        - type: null
48        - type: boolean
49      description: Indicates the requirement for oil cooling for the transformer
```

```
50
51     $comment:
52
53     #=====
54
55     pressure_relay:
56
57         oneOf:
58             - type: null
59             - type: boolean
60         description: Indicates the presence of a sudden pressure relay
61
62         $comment:
63
64         #=====
65
66         cooling_air_fan:
67
68             oneOf:
69                 - type: null
70                 - type: boolean
71             description: Indicates the presence of a cooling air fan(s)
72
73             $comment:
74
75             #=====
76
77             coolant_pump:
78
79                 oneOf:
80                     - type: null
81                     - type: boolean
82                 description: Indicates the presence of a coolant pump
83
84                 $comment:
85
86                 #=====
87
88                 gas_monitor:
89
90                     oneOf:
91                         - type: null
92                         - type: boolean
93                     description: Indicates the presence of a gas monitor
94
95                     $comment:
96
97                     #=====
98
```

07_hvac.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11    cfm_rating:
12
13      oneOf:
14        - type: null
15        - type: number
16      description: Indicates the capacity rating for the hvac unit in CFM
17
18      $comment:
19
20      #=====
21
22      static_pressure:
23
24        oneOf:
25          - type: null
26          - type: number
27        description: Indicates the static pressure for the hvac unit in inch water
28        ↪ column
29
30        $comment:
31
32        #=====
33
34      heating:
35
36        oneOf:
37          - type: null
38          - type: boolean
39        description: Indicates the presence of a heating function in the hvac unit such
40        ↪ as heating coil or gasburner
41
42        $comment:
43
44        #=====
45
46      cooling:
47
48        oneOf:
49          - type: null
```

```
48     - type: boolean
49     description: Indicates the presence of a cooling function in the hvac unit such
↪ as cooling coil
50
51     $comment:
52
53     #=====
54
55     dehumidifier:
56
57         oneOf:
58             - type: null
59             - type: boolean
60         description: Indicates the presence of a dehumidifier
61
62         $comment:
63
64         #=====
65
66         maintainable_damper:
67
68             oneOf:
69                 - type: null
70                 - type: boolean
71             description: Indicates the presence of a maintainable damper
72             $comment:
73
74             #=====
75
76             belts_present:
77
78                 oneOf:
79                     - type: null
80                     - type: boolean
81                 description: Indicates the presence of replacable belts
82
83                 $comment:
84
85                 #=====
86
```

08_blower_fan.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
5  type: object
6
7  $comment: >
```

```
8
9 properties:
10
11   cfm_rating:
12
13     oneOf:
14       - type: null
15       - type: number
16     description: Indicates the capacity rating for the hvac unit in CFM
17
18     $comment:
19
20     #=====
21
22   static_pressure:
23
24     oneOf:
25       - type: null
26       - type: number
27     description: Indicates the static pressure for the hvac unit in inch water
28     ↪ column
29
30     $comment:
31
32     #=====
33
34   drive_coupling:
35
36     oneOf:
37       - type: null
38       - type: string
39     description: Indicates the type of drive coupling
40     enum:
41       - "Direct Drive"
42       - "Belt Drive"
43       - "Gear Drive"
44       - "Flexible"
45       - "Chain Drive"
46       - "Hydraulic"
47
48     $comment:
49
50     #=====
51
52   sealed_bearings:
53
54     oneOf:
55       - type: null
56       - type: boolean
57     description: Indicates the presence of sealed of shielded bearings
58
59     $comment:
```


60 #=====

09_compressor.yml

```

1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11    rated_pressure:
12
13      oneOf:
14        - type: null
15        - type: number
16      description: Indicates the capacity rating for the compressor in kPa
17
18      $comment:
19
20      #=====
21
22    rated_flow:
23
24      oneOf:
25        - type: null
26        - type: number
27      description: Indicates the capacity rating for the compressor in SCM/H
28
29      $comment:
30
31      #=====
32
33    drive_coupling:
34
35      oneOf:
36        - type: null
37        - type: string
38      description: Indicates the type of drive coupling
39      enum:
40        - "Direct Drive"
41        - "Belt Drive"
42        - "Gear Drive"
43        - "Flexible"
44        - "Chain Drive"
45        - "Hydraulic"
46

```

```
47     $comment:
48
49     #=====
50
51     sealed_bearings:
52
53     oneOf:
54       - type: null
55       - type: boolean
56     description: Indicates the presence of sealed of shielded bearings
57
58     $comment:
59
60     #=====
```

10_generator.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5  ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7
8  $comment: >
9
10 properties:
11
12     mobile:
13
14     oneOf:
15       - type: null
16       - type: boolean
17     description: Indicates if the generator is mobile
18
19     $comment:
20
21     #=====
22
23     powerRated:
24
25     oneOf:
26       - type: null
27       - type: number
28     description: Indicates the power rating in kilo watts
29
30     $comment:
31
32     #=====
33
```

```
34 voltage_rating:
35
36   oneOf:
37     - type: null
38     - type: number
39   description: Indicates the capacity rating for the generator in Volts
40
41   $comment:
42
43   #=====
44
45   drive_type:
46
47     oneOf:
48       - type: null
49       - type: string
50     description: Indicates the type of drive
51     enum:
52       - "Engine, Diesel or Bio-diesel"
53       - "Engine, Natural Gas"
54       - "Turbine"
55
56     $comment:
57
58     #=====
59
60     brushless:
61
62       oneOf:
63         - type: null
64         - type: boolean
65       description: Indicates the presence of brushes within the generator
66
67       $comment:
68
69       #=====
70
71       test_load:
72
73         oneOf:
74           - type: null
75           - type: boolean
76         description: Indicates the presence of an electrical connection to attach a test
77 ↪ load
78
79         $comment:
80
81         #=====
82
83         drive_coupling:
84
85           oneOf:
86             - type: null
```

```
86     - type: string
87   description: Indicates the type of drive coupling
88   enum:
89     - "Direct Drive"
90     - "Belt Drive"
91     - "Gear Drive"
92     - "Flexible"
93     - "Chain Drive"
94     - "Hydraulic"
95
96   $comment:
97
98   #=====
99
100   sealed_bearings:
101
102     oneOf:
103       - type: null
104       - type: boolean
105     description: Indicates the presence of sealed of shielded bearings
106
107     $comment:
108
109     #=====
```

11_ups.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7
8  $comment: >
9
10 properties:
11
12   fls:
13
14     oneOf:
15       - type: null
16       - type: boolean
17     description: Indicates if the UPS directly supports any part of the fire
18     ↪ supression or any life safety systems
19
20     $comment:
21
22     #=====
```

```
23 battery_capacity:
24
25   oneOf:
26     - type: null
27     - type: number
28   description: Indicates the power rating in kilo watt hours
29
30   $comment:
31
32   #=====
33
34 voltage_output:
35
36   oneOf:
37     - type: null
38     - type: number
39   description: Indicates the output voltage of the UPS in Volts
40
41   $comment:
42
43   #=====
44
45 battery_type:
46
47   oneOf:
48     - type: null
49     - type: string
50   description: Indicates the type of drive
51   enum:
52     - "Sealed / Valve Regulated Lead Acid"
53     - "Flooded / Vented Lead Acid"
54     - "NiCad"
55     - "Li-ion"
56
57   $comment:
58
59   #=====
60
61 intergrated_charger:
62
63   oneOf:
64     - type: null
65     - type: boolean
66   description: Indicates that the UPS is physically integrated with charger
67
68   $comment:
69
70   #=====
```

12_boiler.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5    ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11    energy_source:
12
13      oneOf:
14        - type: null
15        - type: string
16      description: Indicates the fuel source for the boiler
17      enum:
18        - "Natural Gas"
19        - "Biogas / Digester Gas"
20        - "Propane"
21        - "Electric"
22        - "Fuel Oil"
23
24      $comment:
25
26      #=====
27
28    boiled_medium:
29
30      oneOf:
31        - type: null
32        - type: string
33      description: Indicates the boiled/heated medium within the boiler
34      enum:
35        - Water
36        - Steam
37        - Glycol
38
39      $comment:
40
41      #=====
42
43    heat_rate:
44
45      oneOf:
46        - type: null
47        - type: number
48      description: Indicates the rated heat rate in the boiler in kilo Watts
49
```

```

50     $comment:
51
52     #=====
53
54     max_pressure:
55
56         oneOf:
57             - type: null
58             - type: number
59         description: Indicates the maximum operating pressure for the boiler in psi
60
61         $comment:
62
63         #=====
64
65         max_temperature:
66
67             oneOf:
68                 - type: null
69                 - type: number
70             description: Indicates the maximum operating temperature for the boiler in
71 ↪ degrees celsius
72
73             $comment:
74
75             #=====
76
77             heated_surface:
78
79                 oneOf:
80                     - type: null
81                     - type: number
82                 description: Indicates the heating surface area of the boiler in meters squared
83
84                 $comment:
85
86                 #=====
87
88                 capacity:
89
90                     oneOf:
91                         - type: null
92                         - type: number
93                     description: Indicates the size capacity of the boiler in Litres
94
95                     $comment:
96
97                     #=====
98
99                     tssa_crn:
100
101                         oneOf:
102                             - type: null

```

```
102     - type: string
103     description: Indicates the CRN number issued by the TSSA
104
105     $comment:
106
107     #=====
```

13_pressure_vessel.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
5  ↪ https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
6  type: object
7  $comment: >
8
9  properties:
10
11     contained_medium:
12
13         oneOf:
14             - type: null
15             - type: string
16         description: Indicates the medium within the pressure vessel
17         enum:
18             - "Water"
19             - "Steam"
20             - "Glycol"
21             - "Refrigerant"
22             - "Compressed Air"
23             - "Digester Gas"
24             - "Ozone"
25
26         $comment:
27
28         #=====
29
30     capacity:
31
32         oneOf:
33             - type: null
34             - type: number
35         description: Indicates the size capacity of the pressure vessel in Litres
36
37         $comment:
38
39         #=====
40
41     max_pressure:
```



```
42
43   oneOf:
44     - type: null
45     - type: number
46   description: Indicates the maximum operating pressure for the pressure vessel in
↪   psi
47
48   $comment:
49
50   #=====
51
52   tssa_crn:
53
54   oneOf:
55     - type: null
56     - type: string
57   description: Indicates the CRN number issued by the TSSA
58
59   $comment:
60
61   #=====
```

14_pressure_piping.yml

```
1  ---
2  $schema: "http://json-schema.org/draft-07/schema#"
3  title: asset
4  $id:
↪   https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specificat
5  type: object
6
7  $comment: >
8
9  properties:
10
11   max_size:
12
13   oneOf:
14     - type: null
15     - type: number
16   description: Indicates the maximum pipe size in inches
17
18   $comment:
19
20   #=====
21
22   max_pressure:
23
24   oneOf:
25     - type: null
26     - type: number
```

```
27     description: Indicates the maximum working pressure within the pressure piping
↪   in kPa
28
29     $comment:
30
31     #=====
32
33     max_temperature:
34
35     oneOf:
36       - type: null
37       - type: number
38     description: Indicates the maximum medium temperature within the pressure piping
↪   in degrees celsius
39
40     $comment:
41
42     #=====
43
44     contained_medium:
45
46     oneOf:
47       - type: null
48       - type: string
49     description: Indicates the medium within the pressure piping
50     enum:
51       - "Water"
52       - "Steam"
53       - "Glycol"
54       - "Refrigerant"
55       - "Compressed Air"
56       - "Digester Gas"
57       - "Ozone"
58
59     $comment:
60
61     #=====
62
63     special_application:
64
65     oneOf:
66       - type: null
67       - type: string
68     description: Indicates the speical application required for pressure piping
69     enum:
70       - "piping in fire protection system"
71       - "piping in heating system"
72       - "piping in refrigeration system"
73       - "compressed air piping"
74       - "hot oil piping"
75       - "buried water piping"
76
77     $comment:
```

```
78
79 #=====
80
81 tssa_crn:
82
83   oneOf:
84     - type: null
85     - type: string
86   description: Indicates the CRN number issued by the TSSA
87
88   $comment:
89
90 #=====
```

15_instrumentation.yml

```
1 ---
2 $schema: "http://json-schema.org/draft-07/schema#"
3 title: asset
4 $id:
5   ↪ "https://raw.githubusercontent.com/TW-ASMP/TWmaximoConfig/main/4-Class_Dependent_Specifica
6 type: object
7
8 properties:
9
10   parameter:
11     oneOf:
12       - type: null
13       - type: string
14     description: Indicates the parameter that is being measured
15     enum:
16       - "Density"
17       - "Flow Rate"
18       - "Humidity"
19       - "Level"
20       - "Current"
21       - "Power"
22       - "Position"
23       - "Pressure"
24       - "Speed"
25       - "Temperature"
26       - "Torque"
27       - "UV"
28       - "Vibration"
29       - "Weight"
30       - "Specific Gravity"
31       - "Ammonia"
32       - "Carbon Monoxide"
33       - "Chloramination"
34       - "Chlorine"
35       - "Dissolved Oxygen"
```

```
35     - "Fluoride"
36     - "Methane/LEL"
37     - "Total Hydrocarbon"
38     - "ORP"
39     - "Ozone"
40     - "Particulate"
41     - "PH"
42     - "Sulphite"
43     - "Sulphur Dioxide"
44     - "Suspended Solids"
45     - "Turbidity"
46
47   uom:
48     oneOf:
49     - type: null
50     - type: string
51     description: Indicates the unit of measurement that the instrumentation is
52     ↪ reporting values in
53
54   allOf:
55     - if:
56       properties:
57       parameter:
58         const: "Density"
59     then:
60       properties:
61       uom:
62       enum:
63       - "Kilograms Per Cubic Meter (kg/m³)"
64       - "Grams Per Cubic Centimeter (g/cm³)"
65       - "Grams Per Milliliter (g/mL)"
66       - "Pounds Per Cubic Foot (lb/ft³)"
67
68     - if:
69       properties:
70       parameter:
71         const: "Flow Rate"
72     then:
73       properties:
74       uom:
75       enum:
76       - "Liters Per Second (L/s)"
77       - "Cubic Meters Per Second (m³/s)"
78       - "Gallons Per Minute (GPM)"
79       - "Cubic Feet Per Minute (CFM)"
80       - "Liters Per Hour (L/h)"
81       - "Standard Cubic Feet Per Minute (SCFM)"
82
83     - if:
84       properties:
85       parameter:
86         const: "Humidity"
87     then:
```

```

87     properties:
88       uom:
89         enum:
90           - "Percentage (%)"
91           - "Grams Per Milliliter (g/mL)"
92           - "Milligrams Per Liter (mg/L)"
93           - "Parts Per Million (ppm)"
94           - "Parts Per Billion (ppb)"
95
96   - if:
97     properties:
98       parameter:
99         const: "Level"
100   then:
101     properties:
102       uom:
103         enum:
104           - "Centimeters (cm)"
105           - "Meters (m)"
106           - "Inch (in)"
107           - "Percentage (%)"
108           - "Feet (ft)"
109
110   - if:
111     properties:
112       parameter:
113         const: "Current"
114   then:
115     properties:
116       uom:
117         enum:
118           - "Ampere (A)"
119           - "Milliampere (mA)"
120
121   - if:
122     properties:
123       parameter:
124         const: "Power"
125   then:
126     properties:
127       uom:
128         enum:
129           - "Watt (W)"
130           - "kilowatt (kW)"
131           - "Megawatt (MW)"
132
133   - if:
134     properties:
135       parameter:
136         const: "Position"
137   then:
138     properties:
139       uom:

```

```

140     enum:
141       - "Centimeters (cm)"
142       - "Meters (m)"
143       - "Inch (in)"
144       - "Millimeter (mm)"
145       - "Feet (ft)"
146       - "Degree (°)"
147       - "Randians (rad)"
148       - "Unitless"
149
150   - if:
151     properties:
152       parameter:
153         const: "Pressure"
154     then:
155       properties:
156         uom:
157           enum:
158             - "Pascal (Pa)"
159             - "Kilopascal (kPa)"
160             - "Bar"
161             - "Atmosphere (atm)"
162             - "Pounds Per Square Inch (PSI)"
163             - "Millimeter of Mercury (mmHg)"
164             - "Millimeter of Water (mmH2O)"
165             - "Inch of Water (\WC)"
166
167   - if:
168     properties:
169       parameter:
170         const: "Speed"
171     then:
172       properties:
173         uom:
174           enum:
175             - "Meters Per Second (m/s)"
176             - "Kilometers Per Hour (km/h)"
177             - "Feet Per Second (ft/s)"
178             - "Mile Per Hour (mph)"
179             - "Revolutions Per Minute (RPM)"
180
181   - if:
182     properties:
183       parameter:
184         const: "Temperature"
185     then:
186       properties:
187         uom:
188           enum:
189             - "Degree Celsius (°C)"
190             - "Degree Fahrenheit (°F)"
191
192

```

```

193 - if:
194     properties:
195         parameter:
196             const: "Torque"
197     then:
198         properties:
199             uom:
200                 enum:
201                     - "Newton-meters (N·m)"
202                     - "Foot-pounds (ft·lb)"
203
204 - if:
205     properties:
206         parameter:
207             const: "UV"
208     then:
209         properties:
210             uom:
211                 enum:
212                     - "Watts Per Square Meter (W/m2)"
213                     - "Percentage (%)"
214
215 - if:
216     properties:
217         parameter:
218             const: "Vibration"
219     then:
220         properties:
221             uom:
222                 enum:
223                     - "Meters Per Second (m/s)"
224                     - "Centimeters Per Second (cm/s)"
225                     - "Feet Per Seconf (ft/s)"
226                     - "Inch Per Second (in/s)"
227                     - "Meters Per Second Square (m/s2)"
228                     - "Centimeters Per Second Square (cm/s2)"
229                     - "Feet Per Second Square (ft/s2)"
230                     - "Inch Per Second Square (in/s2)"
231                     - "Hertz (Hz)"
232
233 - if:
234     properties:
235         parameter:
236             const: "Weight"
237     then:
238         properties:
239             uom:
240                 enum:
241                     - "Grams (g)"
242                     - "Kilograms (kg)"
243                     - "Pounds (lb)"
244                     - "Metric Tons (tonne)"
245

```

```
246 - if:
247   properties:
248     parameter:
249       const: "Specific Gravity"
250   then:
251     properties:
252       uom:
253         enum:
254           - "Unitless"
255
256 - if:
257   properties:
258     parameter:
259       const: "Ammonia"
260   then:
261     properties:
262       uom:
263         enum:
264           - "Parts Per Million (ppm)"
265           - "Parts Per Billion (ppb)"
266           - "Milligrams Per Cubic Meter (mg/m³)"
267           - "Percentage (%)"
268           - "Micrograms Per Cubic Meter (µg/m³)"
269
270 - if:
271   properties:
272     parameter:
273       const: "Carbon Monoxide"
274   then:
275     properties:
276       uom:
277         enum:
278           - "Parts Per Million (ppm)"
279           - "Parts Per Billion (ppb)"
280           - "Milligrams Per Cubic Meter (mg/m³)"
281           - "Percentage (%)"
282           - "Micrograms Per Cubic Meter (µg/m³)"
283
284 - if:
285   properties:
286     parameter:
287       const: "Chloramination"
288   then:
289     properties:
290       uom:
291         enum:
292           - "Grams Per Milliliter (g/mL)"
293           - "Milligrams Per Liter (mg/L)"
294           - "Parts Per Million (ppm)"
295           - "Parts Per Billion (ppb)"
296
297
298 - if:
```



```
299     properties:
300       parameter:
301         const: "Chlorine"
302   then:
303     properties:
304       uom:
305         enum:
306           - "Grams Per Milliliter (g/mL)"
307           - "Milligrams Per Liter (mg/L)"
308           - "Parts Per Million (ppm)"
309           - "Parts Per Billion (ppb)"
310
311 - if:
312   properties:
313     parameter:
314       const: "Dissolved Oxygen"
315   then:
316     properties:
317       uom:
318         enum:
319           - "Grams Per Milliliter (g/mL)"
320           - "Milligrams Per Liter (mg/L)"
321           - "Parts Per Million (ppm)"
322           - "Parts Per Billion (ppb)"
323
324 - if:
325   properties:
326     parameter:
327       const: "Fluride"
328   then:
329     properties:
330       uom:
331         enum:
332           - "Grams Per Milliliter (g/mL)"
333           - "Milligrams Per Liter (mg/L)"
334           - "Parts Per Million (ppm)"
335           - "Parts Per Billion (ppb)"
336
337 - if:
338   properties:
339     parameter:
340       const: "Methane/LEL"
341   then:
342     properties:
343       uom:
344         enum:
345           - "Parts Per Million (ppm)"
346           - "Parts Per Billion (ppb)"
347           - "Milligrams Per Cubic Meter (mg/m³)"
348           - "Percentage (%)"
349           - "Micrograms Per Cubic Meter (µg/m³)"
350
351 - if:
```

```
352     properties:
353       parameter:
354         const: "Total Hydrocarbon"
355   then:
356     properties:
357       uom:
358         enum:
359           - "Grams Per Milliliter (g/mL)"
360           - "Milligrams Per Liter (mg/L)"
361           - "Parts Per Million (ppm)"
362           - "Parts Per Billion (ppb)"
363
364 - if:
365   properties:
366     parameter:
367       const: "ORP"
368   then:
369     properties:
370       uom:
371         enum:
372           - "Grams Per Milliliter (g/mL)"
373           - "Milligrams Per Liter (mg/L)"
374           - "Parts Per Million (ppm)"
375           - "Parts Per Billion (ppb)"
376
377 - if:
378   properties:
379     parameter:
380       const: "Ozone"
381   then:
382     properties:
383       uom:
384         enum:
385           - "Grams Per Milliliter (g/mL)"
386           - "Milligrams Per Liter (mg/L)"
387           - "Parts Per Million (ppm)"
388           - "Parts Per Billion (ppb)"
389
390 - if:
391   properties:
392     parameter:
393       const: "Particulate"
394   then:
395     properties:
396       uom:
397         enum:
398           - "Grams Per Milliliter (g/mL)"
399           - "Milligrams Per Liter (mg/L)"
400           - "Parts Per Million (ppm)"
401           - "Parts Per Billion (ppb)"
402
403 - if:
404   properties:
```

```

405     parameter:
406       const: "PH"
407   then:
408     properties:
409       uom:
410         enum:
411           - "Unitless"
412
413 - if:
414   properties:
415     parameter:
416       const: "Sulphite"
417   then:
418     properties:
419       uom:
420         enum:
421           - "Grams Per Milliliter (g/mL)"
422           - "Milligrams Per Liter (mg/L)"
423           - "Parts Per Million (ppm)"
424           - "Parts Per Billion (ppb)"
425
426 - if:
427   properties:
428     parameter:
429       const: "Sulphur Dioxide"
430   then:
431     properties:
432       uom:
433         enum:
434           - "Parts Per Million (ppm)"
435           - "Parts Per Billion (ppb)"
436           - "Milligrams Per Cubic Meter (mg/m³)"
437           - "Percentage (%)"
438           - "Micrograms Per Cubic Meter (µg/m³)"
439
440 - if:
441   properties:
442     parameter:
443       const: "Suspended Solids"
444   then:
445     properties:
446       uom:
447         enum:
448           - "Grams Per Milliliter (g/mL)"
449           - "Milligrams Per Liter (mg/L)"
450           - "Parts Per Million (ppm)"
451           - "Parts Per Billion (ppb)"
452
453 - if:
454   properties:
455     parameter:
456       const: "Turbidity"
457   then:

```

```
458     properties:
459         uom:
460             enum:
461                 - "Grams Per Milliliter (g/mL)"
462                 - "Milligrams Per Liter (mg/L)"
463                 - "Parts Per Million (ppm)"
464                 - "Parts Per Billion (ppb)"
```

Folder: 5-Functions