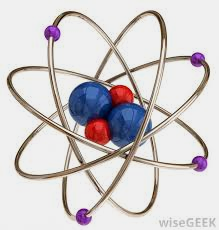
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**Nitrogenics Corp.**

**Bio-Dome**

**Simulator Project**

**Stage 1 Requirements Documentation**

The following requirements relate to software deliverables during stage 1 of the Nitrogenics Corp. Long Term Bio-Dome Survivability Initiative.

**Delta*com* Control Systems Inc.** have been tasked with the delivery of a Simulator prototype of the Bio-Dome Central Control System consisting of 4 Heating units, 4 Ventilation units and 2 Sprinkler units.

The parameters and use case rules outlined in this document must be followed in order to provide the most accurate indications of viability for long-term habitation.

For queries regarding physical placement of equipment during the model assembly please contact the Nitrogenics Corp. Planning Department Manager on Ext. 2344.

Regards.

Homer Johnson

Sr. Bio-Dome Design Team Leader

Nitrogenics Corp.

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**Bio-Dome Climate Parameters:**

**Temperature:**

Legal Temperature Range: >= 20oF – <= 110oF

Optimal Temperature Range: >= 50oF – <= 80oF

Below Optimal Temperature Range: >=20oF - < 50oF

Above Optimal Temperature Range: > 80oF - <= 110oF

Lower Illegal Boundary Limit: < 20oF

Upper Illegal Boundary Value: > 110oF

**Humidity:**

Legal Humidity Range: >= 0% - <= 100%

Optimal Humidity Range: >= 30% - <= 70%

Below Optimal Humidity Range: >= 0% - < 30%

Above Optimal Humidity Range: > 70% - <= 100%

Lower Illegal Boundary Limit: < 0%

Upper Illegal Boundary Value: > 100%

**Wind Speed:**

Legal Wind Speed Range: >= 0 mph – <= 25 mph

Optimal Wind Speed Range: >= 0 mph – <= 10 mph

Below Optimal Wind Speed Range: N/A

Above Optimal Wind Speed Range: > 10 mph - <= 25 mph

Lower Illegal Boundary Limit: < 0 mph

Upper Illegal Boundary Value: > 25 mph

**Bio-Dome Climate Management Controls:**

**Temperature:**

**“Too Hot”** System Status**:**

Primary Control Units: [ **Radiator1, Radiator2, Radiator3, Radiator4** ]

Secondary Control Units: [ **Vent1, Vent2, Vent3, Vent4** ]

Tertiary Control Units: [ **Sprinkler1, Sprinkler2** ]

Procedure for **“Too Hot”** System Status**:**

1. Turn a radiator off
2. If all radiators are off, open a closed vent to half-open
3. If no vents are closed, fully open a half-open vent
4. If all vents are fully open, turn on a sprinkler
5. If all sprinklers are already on, display an error message.

Severity Bandings in the “**Too Hot**” System Condition

Severity**: Low**

* Temperature Range: > 80oF - <= 90oF
* Affected Controls: [ Radiator4, Radiator3, Radiator2 ]

Severity**: Moderate**

* Temperature Range: > 90oF - <= 100oF
* Affected Controls: [ Radiator1, Vent1, Vent2, Vent3 ]

Severity**: Critical**

* Temperature Range: > 100oF - <= 110oF
* Affected Controls: [ Vent4, Sprinkler1, Sprinkler2 ]

If all resources have been used a critical alarm should be raised

**“Too Cold”** System Status**:**

Primary Control Units: [ **Vent1, Vent2, Vent3, Vent4** ]

Secondary Control Units: [ **Sprinkler1, Sprinkler2** ]

Tertiary Control Units: [ **Radiator1, Radiator2, Radiator3, Radiator4** ]

Procedure for **“Too Cold”** System Status**:**

1. Set a fully open vent to half-open.
2. If none are fully open, close a half-open vent.
3. If none are half-open, turn a sprinkler off.
4. If none are on, turn on a radiator.
5. If they are all on, display an error message.

Severity Bandings in the “**Too Cold**” System Condition

Severity**: Low**

* Temperature Range: >= 40oF - < 50oF
* Affected Controls: [ Vent4, Vent3, Vent2 ]

Severity**: Moderate**

* Temperature Range: >= 30oF - < 40oF
* Affected Controls: [ Vent1, Sprinkler2, Sprinkler1, Radiator1 ]

Severity**: Critical**

* Temperature Range: >= 20oF - < 30oF
* Affected Controls: [Radiator2, Radiator3, Radiator4]

If all resources have been used a critical alarm should be raised

**Humidity:**

**“Too Dry”** System Status**:**

Primary Control Units: [ **Sprinkler1, Sprinkler2** ]

Secondary Control Units: [ **Vent1, Vent2, Vent3, Vent4** ]

Procedure for **“Too Dry”** System Status**:**

1. Turn a sprinkler on
2. If all sprinklers are on, start to close vents
3. If both sprinklers are on and all vents are closed, display an error message.

Severity Bandings in the “**Too Dry**” System Condition

Severity**: Low**

* Humidity Range: >= 20% - < 30%
* Affected Controls: [Sprinkler1, Sprinkler2 ]

Severity**: Moderate**

* Humidity Range: >= 10% - < 20%
* Affected Controls: [ Vent4, Vent3 ]

Severity**: Critical**

* Humidity Range: >= 0% - < 10%
* Affected Controls: [ Vent2, Vent1 ]

If all resources have been used a critical alarm should be raised

**“Too Humid”** System Status**:**

Primary Control Units: [ **Sprinkler1, Sprinkler2** ]

Secondary Control Units: [ **Vent1, Vent2, Vent3, Vent4** ]

Procedure for **“Too Humid”** System Status**:**

1. Turn a sprinkler off.
2. If no sprinklers are on, half-open a vent.
3. If no vents are closed, fully open a vent.
4. If all vents are open and all sprinklers off, display an error message.

Severity Bandings in the “**Too Humid**” System Condition

Severity**: Low**

* Humidity Range: > 70% - <= 80%
* Affected Controls: [Sprinkler2, Sprinkler1 ]

Severity**: Moderate**

* Humidity Range: > 80% - <= 90%
* Affected Controls: [ Vent1, Vent2 ]

Severity**: Critical**

* Humidity Range: > 90% - <= 100%
* Affected Controls: [ Vent3, Vent4 ]

If all resources have been used a critical alarm should be raised

**Wind Speed:**

**“Too High”** System Status**:**

Primary Control Units: [ **Vent1, Vent2, Vent3, Vent4** ]

Procedure for **“Too High”** System Status**:**

1. Half-close a fully open vent
2. If no vents are fully open, close a half-open vent
3. If all vents are closed, display an error message.

Severity Bandings in the “Too **High**” System Condition

Severity**: Low**

* Wind Speed Range: > 10 mph - <= 15 mph
* Affected Controls: [Vent4]

Severity**: Moderate**

* Wind Speed Range: > 15 mph - <= 20 mph
* Affected Controls: [ Vent3, Vent2 ]

Severity**: Critical**

* Wind Speed Range: > 20 mph - <= 25 mph
* Affected Controls: [ Vent1 ]

If all resources have been used a critical alarm should be raised