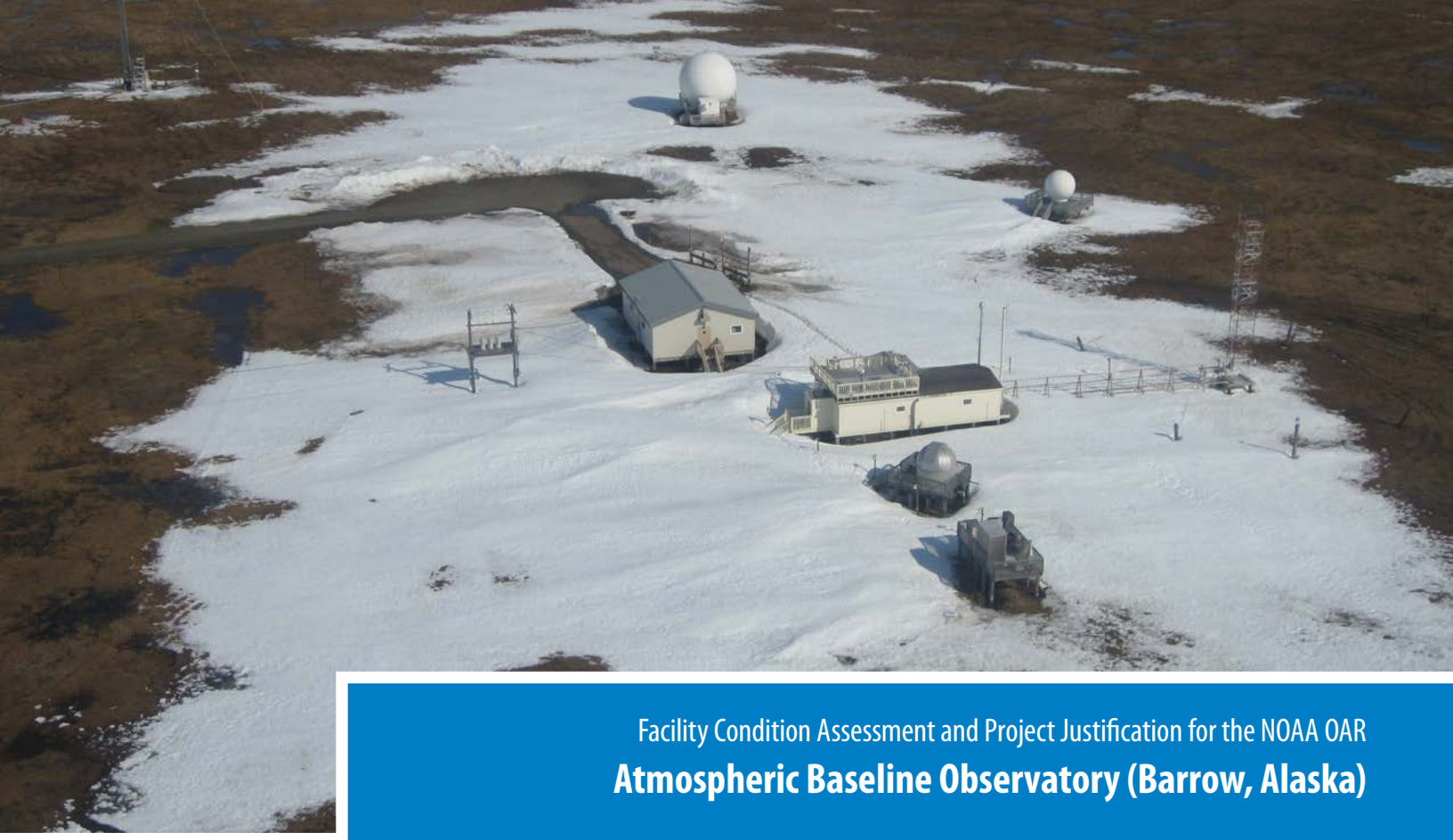

Facility Condition Assessment and Project Justification for the NOAA OAR

Atmospheric Baseline Observatory (Barrow, Alaska)

Final - April 2015

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

FACILITY PROGRAMMING AND CONSULTING

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The contents of this document are not for regulatory approval, permitting, or construction.

Introduction

Facility Programming and Consulting was engaged by the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) to prepare a facility condition assessment and project justification for the *Earth System Research Laboratory, Global Monitoring Division, Atmospheric Baseline Observatory (Barrow, Alaska)*. This document is organized into three sections:

1. Executive Summary
2. Existing Building Condition Assessment
3. Preliminary Project Cost

The intent of this document is to provide a baseline study of the facility condition to include high level observations, identification of deficiencies, and recommendations based on current and planned operating conditions. In addition, this document provides a justification for a new facility, as proposed in 2009. A cost estimate for the new facility, based on the conceptual drawings developed in 2009, is also included.

Project Background

NOAA's Office of Oceanic and Atmospheric Research (OAR)

The following text was provided by NOAA at http://research.noaa.gov/AboutUs/WhoWeAre.aspx.

The Office of Oceanic and Atmospheric Research (OAR) - or "NOAA Research" - provides the research foundation for understanding the complex systems that support our planet. Working in partnership with other organizational units of the National Oceanic and Atmospheric Administration, a bureau of the Department of Commerce, NOAA Research enables better forecasts, earlier warnings for natural disasters, and a greater understanding of the Earth. The role of NOAA Research is to provide unbiased science to better manage the environment, nationally, and globally. The primary components of NOAA Research are:

- The NOAA Research Laboratories
- National Sea Grant College Program
- NOAA Office of Ocean Exploration and Research
- NOAA Climate Program Office
- Office of Weather and Air Quality
- NOAA Unmanned Aircraft Systems
- NOAA Ocean Acidification Program

Existing Facility Description

The following text was provided by NOAA in the Proposed Project Detail dated April 10, 2009.

NOAA Earth System Research Laboratory (ESRL), Global Monitoring Division (GMD), operates a manned Atmospheric Baseline Observatory six miles east of Barrow, Alaska, (71.3° N; 156.6°W) to measure changes in atmospheric climate forcing agents such as carbon dioxide (CO_2) and methane (CH_4), ozone depleting chemicals such as chlorofluorocarbons, air pollution from Eurasia known as Arctic Haze, stratospheric ozone depletion, and surface ultraviolet radiation (UV) levels, to name only a few of the more than 200 measurements conducted at the facility. NOAA established the observatory near Barrow in 1973 in a single room, 960 square foot temporary building constructed by the Naval Research Laboratory (NRL) as a radio shelter. It was subsequently donated to NOAA.

Adjacent to the main building, there is a two-vehicle garage (1,400 square feet, constructed in 2000) with storage space for up to 100 standard gas cylinders and a Bobcat for snow removal and cylinder transport. Additional facilities consist of a 60-foot tall walk-up sampling tower adjacent to the observatory, three elevated platforms for equipment mounting, and a number of smaller towers and instrument installations on the tundra. At the edge of the 100 acre Barrow Observatory land parcel is an unmanned Department of Energy (DOE) Atmospheric Radiation and Monitoring (ARM) facility built to conduct cloud and solar radiation measurements related to Arctic climate change.

Two NOAA/National Environmental Satellite, Data, and Information Service (NESDIS) polar orbiting satellite downlink antennae have recently been added to the 100 acre NOAA Barrow site as this is one of the few federally owned pieces of land on the Alaskan North Slope accessible to NOAA. The Barrow site is also host to a NOAA/NESDIS Climate Reference Network (CRN) station that is 200 yards from the main building. The CRN station does not use Barrow Observatory building space. The CRN station is expected to be in operation at the Barrow Observatory site for centuries.

The Barrow Atmospheric Baseline Observatory is the farthest north of the six manned observatories operated by NOAA/ESRL/GMD; the others are at Trinidad Head, California; Mauna Loa, Hawaii; American Samoa; Summit, Greenland; and South Pole.

The Barrow Observatory is operated by two NOAA Federal staff that live in NOAA housing in Barrow. The staff attends to measurements at the Barrow facility six days of the week and on Sundays during intensive study periods.

Location Map

Figure 1-1: Aerial photograph of the Barrow Observatory site in relation to the town of Barrow, Alaska.

Figure 1-2: Aerial photograph of the Barrow Observatory site as viewed from the South. The garage is located at center; observatory to the right.

Project Justification

Facility Condition Assessment (FCA)

A Facility Condition Assessment was conducted in April 2015. The following is a summary of the findings. The complete FCA may be found in Chapter 2 of this document.

The existing Atmospheric Baseline Observatory in Barrow, Alaska is a wood frame structure (construction Type V-B) with occupancy class Business (B). The facility was built as a temporary structure and was never intended as a permanent solution. However, it has housed ongoing research for over 40 years.

According to the survey, the Observatory is in poor condition and appears to have outlived its useful life. While improvements have been made to the facility in the past, the point at which the benefit of the costs invested in the facility have outweighed the required maintenance and repairs has passed. Deficiencies include lack of fire protection and suppression system, no sanitation provisions, and inadequate insulation to combat the Arctic climate. Nearly all building envelope systems are substandard or failing and the interior finishes are worn, tired and in need of upgrade. In addition, mechanical and electrical systems are inadequate to meet current demand for operations. Staff accommodations for health and safety are practically non-existent. In addition, the space is too small to accommodate any new projects beyond the scientific experiments currently being performed at the site.

Due to the surface conditions at the time of the survey, the foundation condition was not determined.

A 1,400 square foot garage, constructed in 2000, was not included in the assessment. Renovation and/or replacement of the garage is not included in this scope.

The Need for a New Facility

The Atmospheric Baseline Observatory is perfectly situated in its present location on 100 acres of property, upwind of human habitation, in an isolated area which allows for the monitoring of air that has not been impacted by regional air pollution sources. This "clean air sector" receives air from regions where there is no habitation or transport corridor from anywhere between 100 to 5,000 miles upwind of the station. In addition, the current site is appropriate for radiation measurements which require a surface background of at least five acres which is natural and undisturbed, and will remain so in perpetuity.

Since the building was first occupied in 1973, the number of scientific programs conducted at the Barrow Observatory has tripled. Due to the space constraints and physical, mechanical, and electrical limitations of the existing facility, no additional programs or staff are able to be accepted

or accommodated, thus limiting the ability of NOAA to meet its goals in climate observation and air quality monitoring in the Arctic, where global warming is being experienced to a greater extent than in lower latitudes. The NOAA Barrow Observatory works closely with and provides data to support research of universities and other agencies.

The demand for Arctic climate researchers to site instrumentation at this location is high. Barrow Observatory measurements are anticipated to continue for at least the next 100 years and are core elements of NOAA's responsibilities for monitoring the state of the current global atmosphere and changes over time. In 2002, the National Science Foundation (NSF) published a report recommending the upgrade of the NOAA Barrow Observatory as the most pressing and cost effective means to enhance new atmospheric research and monitoring in the United States.[1] However, no new measurements have been accepted since 2007 due to the inadequacy of the Barrow Observatory to meet the demand. In addition to the building space constraints, inefficiencies in the mechanical and electrical systems have resulted in a large cost for facility operation (estimated $70,000 annual).

NOAA has proposed a new, energy-efficient 2,400 gross square foot (GSF) observatory building to meet the current and forecasted future demand for Arctic climate research. To facilitate construction, a pre-fabricated modular building with a conventional pile foundation is proposed. Construction would occur over a three year period in order to take into account the unique requirements of construction in the Arctic permafrost environment.

The new facility would support up to three personnel (two existing plus one for future growth) and would include modern laboratory facilities for data collection, air sampling and analysis, roof-mounted equipment for study of solar radiation, and other research and equipment related to climate monitoring. Support spaces would include a private office, workshop area for equipment repair, a sound-dampened pump room for pumps and other noisy instrumentation, and an instrument storage and staging area. A water tank holding area and an indoor toilet would also be provided.

Existing instrumentation would be relocated to this facility. A new, enclosed walkway between the garage and new facility would be constructed to increase safety of workers traveling between buildings from both exposure to the harsh Arctic climate (temperatures as low as -40°F) and encounters with native wildlife, such as polar bears.

This new observatory facility would provide better support facilities for existing partnerships with researchers at universities and other agencies, while also allowing opportunity for new relationships and expanded collaboration.

1 *The Feasibility of a Barrow Arctic Research Center*, National Science Foundation, 2002.

Demolition of the existing facility is not envisioned. Instead, it would be available for renovation by other partner agencies to support their proprietary research. The building may also be utilized for storage of general supplies and materials, such as gas cylinder tanks, which do not require the same level of conditioned space as that which has human occupants.

At the time of publication of this report, there was no intention of moving any other operations to this site. Should this facility be designed and constructed as proposed here, NOAA believes it will easily meet the needs of the agency for at least the next 25 years.

Project Vision and Goals

The following were outlined as items which would make the new facility a success:

- Provide modern facility which allows the space and flexibility to accommodate additional collaboration with both existing and new partners
- Upgrade working conditions (and ultimately employee morale) for current and future staff, including improved workplace safety and sanitation facilities
- Design a building which is protected from fire danger with an automatic fire suppression system that protects both research equipment/data and the personnel
- Design an energy-efficient building to reduce life-cycle operation costs

Preliminary Project Cost

The preliminary project cost for the New NOAA OAR Atmospheric Baseline Observatory in Barrow, Alaska is $4.6 million. Costs are based on the preliminary concepts for a 2,400 SF structure as originally developed in 1992. Included is the prefabrication of modular building components in Seattle which are then barged to Barrow upon completion. In addition, construction will avoid the use of certain materials which are susceptible to off-gassing that could affect air samples taken at the observatory. Costs also take into account escalation related to a three year construction period which will allow for the contractor to work around the Arctic environment.

Total preliminary construction cost is approximately $3.4 million. The remainder of the budget will be utilized for items including, but not limited to, A/E design fees and furniture, fixtures, and equipment.

Please note, this construction cost estimate is preliminary and may not reflect the refined and final estimates produced during the design phase. Additionally, the actual project budget will be determined by available funding sources.

For comparison purposes, a cost estimate was developed for repair of the existing facility based on the deficiencies noted in the condition assessment. Total project cost is estimated at approximately $780,000.

Introduction

NOAA Earth System Research Laboratory (ESRL), Global Monitoring Division (GMD), operates a manned Atmospheric Baseline Observatory six miles east of Barrow, Alaska, (71.3° N; 156.6°W) to measure changes in atmospheric climate. The observatory near Barrow was constructed in 1973 in a single room, 960 square foot temporary building constructed by the Naval Research Laboratory (NRL) as a radio shelter. It was subsequently donated to NOAA.

Adjacent to the main building, there is a two-vehicle garage (1,400 square feet, constructed in 2000) with storage space for up to 100 standard gas cylinders and a Bobcat for snow removal and cylinder transport. Additional facilities consist of a 60-foot tall walk-up sampling tower adjacent to the observatory, three elevated platforms for equipment mounting, and a number of smaller towers and instrument installations on the tundra. At the edge of the 100 acre Barrow Observatory land parcel is an unmanned Department of Energy (DOE) Atmospheric Radiation and Monitoring (ARM) facility built to conduct cloud and solar radiation measurements related to Arctic climate change.

In order to understand the condition of the existing facility and its deficiencies, Facility Programming and Consulting engaged Richard S. Armstrong, PE, LLC, in association with Steve Fishback, Registered Architect (RA), to conduct a Facility Condition Assessment (FCA) in April 2015. The information which follows is the findings from their survey. Neither the garage nor the sampling towers / equipment platforms were included in the assessment.

Location Map

Figure 2-1: Aerial photograph of the Barrow Observatory site in relation to the town of Barrow, Alaska.

Figure 2-2: Aerial photograph of the Barrow Observatory site as viewed from the South. The garage is located at center; observatory to the right.

Existing Facility Summary

Location

The NOAA Barrow Baseline Observatory is six miles north east of Barrow and is accessed by way of Stevenson Street. The 100 acre site is sparsely developed and occupied primarily by research and measuring devices. Buildings include the 43 year old, 960 square foot observation building and a 1,400 square foot garage/shop structure that was built in 2009. The site also includes an unmanned DOE atmospheric radiation and monitoring facility, a 60 foot tall walk-up sampling tower and three elevated equipment platforms. The site is relatively level, within one mile of the Arctic Ocean and between two small lakes. The facility is located at approximately 71.31 – 156.61 on the northern edge of North America.

Background

The observatory was built in 1972 by the U.S. Navy as a temporary structure. Today world class research is critical to climate research, and atmospheric studies are being conducted in the original structure. This work requires a site that is upwind of human habitation in an isolated area. The site ideally meets this environmental requirement.

Facility Data

The one-story wood frame building is founded on wooden freeze back piling. The built up roof system is covered with a 90 pound granular coated cap sheet over the main building. The arctic entries are both roofed with standing seam metal roofs. An observation platform has been constructed out of wood and covers the center portion of the main structure. Access to the observation platform is by way of "GRIP STRUT" stair treads supported from wood stringers. The stairs have no riser closers and are not ADA compliant.

The wood frame structure is categorized as construction Type VB by the Alaska prevailing 2009 International Building Code. The occupancy class is "B" and the building area is approximately 960 square feet. No fire protection systems or infrastructure exists for the facility. The facility includes no sanitation provisions, is far under insulated and is generally in marginal condition for habitation.

Operational Program

The NOAA Barrow Baseline Observatory is an atmospheric and climate measuring research center. The building is full of testing, measuring and recording equipment. The space has essentially no support facilities for its daily staff of two, or the additional visiting scientists. There is no potable running water, toilet service, break area or office space. However, the mission focused structure is occupied approximately eight hours per day, five days a week.

Investigation conducted before the visit indicated a third staff position was needed to support the research conducted at the site but not enough working space exists to accommodate the positon. Our investigation also revealed there are additional scientific programs that need to be conducted at the Barrow facility that simply cannot be accommodated due to the space limitations.

The building is provided with operable windows, but the weather conditions for approximately nine months each year are simply too cold and windy to open windows. During these months there is no ventilation, only recirculating chilled air which leads to stale air and poor working conditions. This poor indoor air quality coupled with equipment sound levels reported to be 80 dB makes for an uncomfortable work environment. Conditions found within the Barrow station are not conducive to the level of concentration and attention to detail needed to perform the duties of this operation.

Building Conditions

Known or Reported Deficiencies

Prior to the onsite investigation, research was conducted to determine what if any building conditions have been previously identified or reported upon. Through this investigation we obtained a copy of a report prepared by Brian Vasel dated 3/12/2009 and updated 4/10/2009. A number of significant deficiencies were identified in the report. When our site investigation occurred we made a point of evaluating those items that Mr. Vasel noted to see if corrections had been made. Those we felt were still relevant are reported in the body of this report.

The deficiency items noted in Mr. Vasel's 4/10/2009 report include the following.

- The facility does not include a toilet, running water, or sanitary services.
- The structure is inadequately insulated.
- No fire suppression other than hand held fire extinguishers are provided.
- Sound levels exceed 80 dB.
- The facility does not include amenities for food storage or meal preparation.
- The building is cramped.

Facility Condition Assessment

Building Site

The Barrow NOAA air monitoring site is one of the furthest east sites connected to the road system in the community of Barrow. The project site is accessed by way of Stevenson Street then to Dewline Road and onto

the 100 acre NOAA owned site. Several other federal agencies are located nearby, providing science and research based services.

Access to the facility is provided by a raised compacted gravel road from Barrow, through Browerville along the Arctic Ocean, past the Dew Line facilities. The Barrow site is definitely positioned on an out-of-the-way site. The remote location is served by power and data but no other utility services.

The prevailing east wind is unrestrained across thousands of miles east of the facility. These winds result in significant snow drifts that form in September and October, build through the winter and normally reach their peak in February or March. These drifts regularly cover the observatory building. By mid-April drifts quickly begin to diminish and by May when 24 hour daylight occurs, the snow is gone and the tundra is exposed.

Topography is generally flat with the exception of the 3 – 4 foot high gravel pads constructed to support the structures and equipment and to protect the sensitive permafrost from melting due to building heat.

Other than the low lying tundra, there is no other vegetation or topographic features that are not man made near the observatory.

Building Envelope

The 960 square foot building is a humble, rudimentary structure built for utility and economy. A 2:12 pitch roof, covered by 90 pound asphalt roll roofing is covered by an observation deck. The observation deck is protected by way of a 36 inch high wooden guard rail. The guard rail system fails to comply with IBC paragraphs 1013.2 for height or 1013.2 for opening size as required by the currently adopted 2009 IBC.

The marginal roofing system is a very weak system for a structure containing thousands of dollars of water sensitive electronics. Reportedly, one section of the roofing blew off last winter and will be repaired this summer when temperatures rise to the point these asphalt-based roofing products

Barrow Observatory building envelope at time of survey. Photograph at right demonstrates condition of fascia and siding.

can be reinstalled. This roofing solution clearly does not provide adequate water protection for the building. The building's two arctic entries are covered in a galvanized steel standing seam roof. The roof gauge appears to be 24 gauge but may be 22 gauge. This product provides far greater moisture protection than the roll roofing mopped into an asphalt emulsion that is installed on the sensitive portion of the building.

The roof assembly uses a "hot roof" approach with insulation directly beneath the roofing substrate. This roof configuration works well in the coastal arctic since wind typically blows snow off the roof so ice dams are avoided due to the lack of moisture. The only insulation on the roof is assumed to be batt insulation between the joists/trusses. There is no way to gain access to the roof insulation but it is assumed to be R 24 – 30. Roof insulation in Barrow is typically installed to reach R values of 55 – 70.

There are no gutters or rain water control for water coming off the roof. The eaves of the roof project past the exterior wall approximately eight inches along the typical wall section and four inches at the arctic entries.

Fascia boards are painted 2x6 members or 1x6 trim over 2x6 members depending on the area of the building. All fascia boards are painted canary yellow to match the building siding color. The condition of the fascia and paint are good. The building is sided with eight inch beveled siding with six inch exposure. The wood species is unknown but it is assumed to be hem/fir grade 1 or 2. Again the siding condition and finish are good although there are some areas of paint that are losing adhesion and coming loose from the wood. The craftsmanship employed when the siding was installed seems to be better than the fascia, courses are level and even, joints are tight in spite of the cold dry environment.

The exterior wall assembly is well suited for buildings located in the mid latitudes, but not arctic conditions.

The typical wall assembly is comprised of wood siding over half inch plywood sheathing that is supported with 2x6 stud framing and insulated with R-19 batt insulation between the studs. In the entryways, it is assumed there is a 6 mil polyethylene vapor retarder that is covered with the 3/8 inch thick plywood on the exterior walls of the main building and 5/8 inch gypsum board in the vestibules. The painted plywood/gypsum board serves as the interior finish. This assembly description is based on visual observation of the finishes on the exterior and interior surfaces, the overall measured wall thickness and the observation of 6 mil polyethylene vapor retarder in the ceiling assembly.

New wall construction in Barrow is typically insulated to achieve R values of 45 – 50 and direct, through wall stud framing is avoided to minimize heat transfer through studs.

The exterior doors and windows appear to have been installed within the past 5-10 years. The windows are high quality vinyl windows that are glazed with one inch thick insulated glass units and feature a tilt/turn

function (opens as awning and swinging windows). All windows are in 24x36 inch openings and all seem to be in good working order. Window seals and gaskets are in like-new condition.

Each of the two entryways is configured as a two-door arctic vestibule system consisting of an exterior door and an interior door used to prevent cold winds from directly entering the facility. These doors appear to have been installed at approximately the same time that the windows were installed. Unfortunately the doors have not served as well as the windows. The exterior doors and frames are all hollow metal. Frames appear to be 16 gauge and doors 18 gauge. Due to the seasonal building movement, all doors are reported to bind on occasion. At the time of our visit, the west egress doors were binding, particularly the inner door of the arctic door system. This situation reportedly prevents the locking mechanism from engaging the strike plate, which leaves the facility unlocked and unsecure. This may have been the reason why a surface-mounted dead bolt is installed on the north door, which is a violation of IBC 1008.1.9.4. It was also reported that the doors occasionally freeze to the threshold as a result of snow blowing under the door, melting and refreezing to the door face. Lock sets are mortise style and appear to be Class 2 security grade which is appropriate for this application. All doors in the arctic entry system are equipped with a small vision light. Exterior doors open into the space to protect the occupants from being barricaded in, or out of the building after intense blizzard conditions where snow can sometimes drift completely over the building. While the exterior door system is marginally functional, a much better solution would be to provide exterior arctic doors that are built more like the doors used in a walk-in freezer. These doors need to be constructed of rigid frames with compensating jamb and head framing designed to allow structural movement to remain independent of the door frame. These doors are typically provided with heated thresholds and jambs to keep the door from freezing to the threshold and frame. All existing exterior doors are in need of new weather seals and paint. These doors also have evidence of rust forming on the relight and door frames.

Sample photographs of existing condition of windows and doors

RECOMMENDATIONS

- Replace all roofing with 80 mil fully adhered EPDM roofing that is installed over two layers of 3 inch thick extruded polystyrene or polyisocyanurate rigid insulation. The insulation is to be covered with a suitable cover board over which the EPDM is to be applied. Reconstruct the observation deck using steel tube structural columns that are bearing on the existing pile caps/grade beams. The columns will need to be installed where they penetrate the roof insulation to avoid condensation. Rebuild guardrails to code. With the existing insulation left in place and the additional R-30 insulation roof assembly will provide an R value of approximately 60. New fascias will be required to cover the new roof thickness. This will be an expensive, disruptive construction project that should be carefully evaluated prior to design.
- Replace exterior door and frame system with an assembly that is more suitable for the environment.
- Remove the existing siding and add a six inch thick pre-insulated metal wall panel to increase the wall thermal performance. This improvement will again be a costly modification to a 40 plus year old building.

Structure

The building is founded on round wood pilings that appear to incorporate a freeze back style placement method. The various diameter piling are approximately eight feet on center and support and 8x10 grade beam/pile cap. The connection between the pile and beam is concealed. Due to the snow and ice at the time of the inspection it was not possible to determine if the piling are rotting at the point of contact with the ground (the typical point of failure of this piling system).

It appears the floor system is 2x12 joists, most likely dimensional lumber. The floor sheathing is 3/4 inch thick plywood covered with a glue down carpet. It was not possible to determine if the plywood is T&G or nailed versus screwed down. No soft spots or floor movement/squeaks were observed. Beneath the joists is a layer of 3/8 or 1/2 inch thick plywood forming a soffit. Walls are 2x6 wood studs.

There is a small hole in the ceiling that allowed observation of the roof ceiling assembly. A half inch thick plywood sheet is attached to the bottom of the ceiling joist or roof truss. It is not possible to determine if the roof is comprised of a 2:12 roof truss or a series of joists with ceiling joists. It is assumed that the roof members are roof trusses. Since the plywood is covered with adhered Acoustic Ceiling Tile (ACT) and the top member is insulated and covered with a vapor retarder it was not possible to observe joist spacing or connector types. The framing members supporting the ceiling are 2x6.

RECOMMENDATIONS

- When the snow leaves the site confirm by use of a pointed probe that the piling are sound where they enter the ground.

Interior Doors, Finishes, and Furnishings

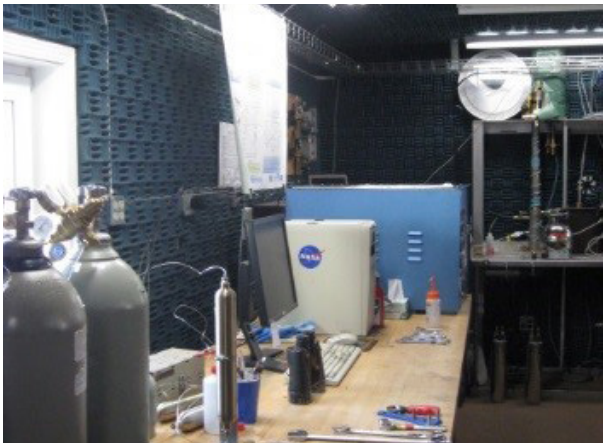
The Barrow observatory is a 40+ year old remote research facility and was constructed and continues to be a utilitarian structure. Finishes and furnishings are humble and basic.

The ceiling finish in most of the building is an adhered 5/8 inch thick small square format acoustic tile. The white tiles have a fissured face and are 8x8 inches in dimensions. The tile are in very good shape and are likely in the best condition of any of the finishes.

In an effort to absorb the high equipment noise, the ceiling of the eastern portion of the building is covered with blue foam rubber acoustic panels cut into a grid system of rotating ridges. The acoustic panels have no product information printed on them. There is a high likelihood this finish does not comply with flame spread or smoke development minimums required in IBC 803.1.1.

Wall conditions throughout the facility are generally serviceable. The paint and surface paper of the gypsum board in the west arctic entry is abraded but generally serviceable. The one important exception is the flame spread/smoke development concern in the eastern portion of the building. If it cannot be determined that the flame/smoke concern is justified or irrelevant, then the material needs to be replaced with a new suitable acoustic product.

The facility is provided with a low knap loop carpet that is glued to the plywood subfloor. The medium brown color carpet is past its service life. Seams are open and separating causing a potential tripping hazard. The carpet is stretched in most traffic areas and the fibers are matted.



Rubber acoustic panels covering walls and ceiling

Worn carpet

Arctic entry

Panel wood interior door with knob latch set

Furnishings and equipment located in building and in Instrumentation Room (right)

The arctic entry floors are covered with slip resistant sheet vinyl. The material is past its service life, sections of the raised pattern are worn off and the area in front of the north door has worn through to the plywood.

There are two interior doors one leading into a small storage room and the other into the access space for the air handler. The store room door is a 1-3/4 inch thick, 3x7 foot wood panel door. The wood appears to be fir and the finish is clear. The access door is a hollow core wood door approximately 30 inches wide x 7 feet high. Both interior doors are equipped with knob latch sets which does not comply with ADA access requirements.

Exposed interior walls in the western portion of the building are covered with 4x8 sheets of plywood with 3/8 inch x 1-1/2 inch wooden battens at each vertical joint. Interior vestibule walls are painted gypsum board as are some demising partitions. The walls in the eastern portion of the building are covered with the same blue foam acoustic finish found on the ceiling. As previously mentioned, this product is not expected to comply with IBC 803.1.1.

Furnishings in the building are essentially comprised of racking, shelving and very small workstations. There is also a small repair workshop that includes two work tables, parts and tools.

Other furnishings include two vinyl, roll up type shades mounted over two windows to keep sunlight off the instruments. A cable tray runs just below the ceiling and provides cable access to most of the facility's perimeter.

Little can be said about the furnishings other than they are utilitarian.

RECOMMENDATIONS

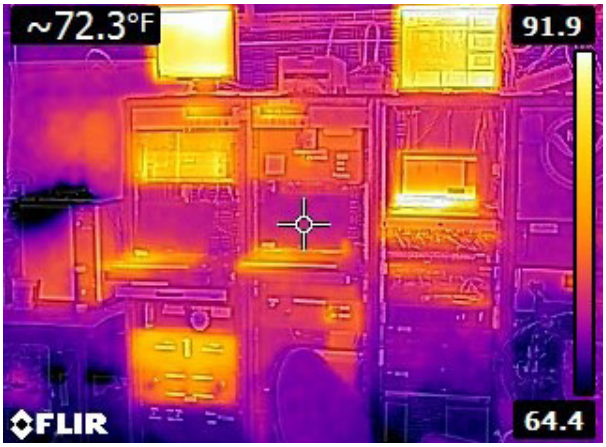
- Patch and paint the gypsum board north wall of the west arctic entry.
- Confirm flame spread/smoke development of acoustic product and replace if flame spread of 25 and smoke development of 0-450 cannot be confirmed.
- Replace the carpet preferably with a high quality homogeneous sheet vinyl that complies with federal material standards.
- Replace the arctic entry flooring with a high quality, homogenous sheet vinyl and walk-off mats.

Kitchen appliances on-site

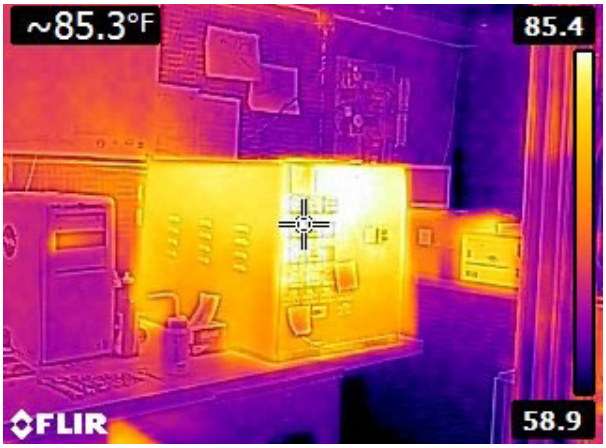
Appliances and Equipment

There is one combination two burner electric stove, sink, and refrigerator on the premises. The unit kitchen is very dated.

Specialized laboratory equipment is not listed by function, make, or model, but pictures are provided below, along with some infrared pictures of the equipment heat emissions which make the equipment appear to glow.



Equipment panels emitting up to 92 degrees Fahrenheit heat



Equipment panels emitting up to 85 degrees Fahrenheit heat

Mechanical Systems - Heat Generation and Distribution

All heat is produced by either the electric ceiling mounted cabinet unit heater at the main entry, or radiant wall heaters in the rooms, including a small radiant wall heater in the side entry vestibule. Each heater is controlled by a local thermostat. The heaters appear to be original equipment, so replacement parts are most likely not available. There is no heat distribution system outside of the radiant wall heaters in each of the three rooms. The heating system is not interlocked with the cooling system, so thermostatic set points could cause simultaneous heating and cooling to occur.

Electric heating is the only viable heat source for this site because of the need to avoid fossil fuel combustion at the building due to the proximity of highly sensitive air sampling equipment that could be compromised with the proximity of combustion equipment.

There is no humidity control system in place at the site, but staff have not complained of static electricity caused failures, so this is apparently not an issue at Barrow.

RECOMMENDATIONS

- The heaters are adequate for continued use if the building is repurposed for storage or occasional use.

Mechanical Systems - Cooling System

The equipment in this building produces a good deal of heat, such that the air conditioner must be operating most of the time, even in the Barrow arctic weather. The instrument room and the tool room are cooled with one single zone air conditioner system that is located in a closet in the tool room. The system is on most of the time, and the equipment is outdated. Ironically, the observatory uses an air conditioner system that requires R-22 refrigerant to operate. R-22 (HCFC-22) is among the specifically

Air conditioning system

targeted refrigerants for 90% reduction in consumption by January 1, 2015 due to its harmful impact on the environment. The observatory is all about studying ozone depletion in the atmosphere, so having this refrigerant is counter to the mission of the facility. This system should be replaced as soon as possible.

The air conditioning unit is also installed in such a way as to prohibit proper maintenance, and it violates the national electrical code by not providing adequate clearance around the disconnect to the equipment. Any maintenance on the compressor system would require a contortionist to squeeze his way to the back of the room in order to access the equipment for repairs. This installation presents a hazard to any repair technician due to the lack of proper access.

The ducting system consists of one basic ceiling mounted duct that is routed to the East and the West to supply the main instrument room and the tool room. The cooling air is controlled with two thermostats, one in the main instrument room, and one in the tool room. The main thermostat controls the air conditioner operation, and the secondary thermostat simply closes a motorized damper in the common duct to shut off cooling air to the tool room so all of the air is routed to the instrument room.

RECOMMENDATIONS

- If this building is to remain in use as any type of space that requires continued operation of the air conditioner, it is recommended that a new a/c unit be installed that complies with current Department of Environmental Conservation (DEC) guidelines for refrigerants, as well as national electrical code guidelines for clearance around electrical equipment, and complies with the manufacturer's requirements for access around the equipment.

Mechanical Systems - General Ventilation Systems

There is no ventilation system in the building with the exception of operable windows, which will create significant cold drafts if opened any time except for the warmest summer days, making operable windows a less than desirable method of ventilation for this building.

RECOMMENDATIONS

- There is no space to locate a new central heating, cooling, and ventilation unit in this building, and the system as presently configured is not acceptable from a code, energy, or maintainability standpoint. It is recommended that a new building be erected that would have proper HVAC systems, and this building can then become a storage area with no further cooling or ventilation requirements. The existing air conditioner should be removed and disposed in accordance with federal regulations, since it would not be worth the cost of a retrofit to an accepted refrigerant due to the other clearance and code issues, not to mention the age of the existing unit.

Mechanical Systems - Domestic Water System

There is no domestic hot water system in the building.

RECOMMENDATIONS

- It is recommended that a new building be constructed that would have potable water (even if it is stored in potable water containers that are filled by truck service similar to water delivery in parts of Barrow that have no connected utility water or sewer system).

Mechanical Systems - Cold Water Systems

At present, there is no cold water service at the building. Staff use a plastic container to melt snow that is then used for water to make tea or other drinks. There are no other plumbing fixtures outside of the unit kitchen with sink, and melt water is not sanitized.

RECOMMENDATIONS

- Provide a new building that has a toilet room with a holding tank, as well as piped water to a kitchenette and toilet room. There is no room in the existing structure to construct a toilet room or a holding tank for water and wastewater.

Mechanical Systems - Waste Piping and Service

There is no waste piping or holding tank at this facility, and no sanitary facilities for hand washing or toilet facilities.

RECOMMENDATIONS

- There is no room in the facility for any plumbing fixtures, so a new building with adequate space for code required plumbing facilities is recommended.

Mechanical Systems - Plumbing Fixtures

There is no waste piping or holding tank at this facility, and no sanitary facilities for hand washing or toilet facilities.

RECOMMENDATIONS

- There is not room in the facility for any plumbing fixtures, so a new building with adequate space for code required plumbing facilities is recommended.

Mechanical Systems - Fire Protection System

There is no fire protection system in this facility outside of two fire extinguishers, one located near the entry and one located at the instrument room. Both fire extinguishers appear to be charged, but neither extinguisher has any inspection tag indicating that it has been inspected by a certified fire extinguisher technician.

RECOMMENDATIONS

- It is recommended that the building receive proper sized and tagged fire extinguishers until a replacement facility can be constructed.

Electrical Systems - Electrical Service

The building is served with a 225 amp, 120/208 volt, 3 phase, 4 wire (aluminum wiring from the transformers to the main distribution panel (MDP) electrical service that is fed from three pole mounted transformers that are located between this building and the garage. The service is above ground between the utility transformers and the building.

Voltage measurements at the panel were 208-211 volts AC line to line, and typically 118 volts line to neutral, which is within NEC tolerance.

There is no backup generator to the building, primarily due to the concern for exhaust gas contaminating the air in the vicinity that is being sampled.

RECOMMENDATIONS

- It is recommended that the power to the facility, or to a replacement facility, be routed through or in parallel with the adjacent USAF radar facility through a transfer switch. We understand that the radar facility has its own independent power system, so if their power could be wired through an automatic transfer switch to automatically switch over to radar system power, the need for large uninterruptable power supplies (ups) could be reduced to only a ups needed for the time

required to transfer the load from the utility to the radar site system. Power is reportedly lost at the facility 1-2 times per year.

Electrical Systems - Bonding and Grounding

The neutral wiring is required to be tied to the ground wiring at the point of service, but all neutrals and grounds are interconnected at the main distribution panel. There are quite a few wires connected to a single grounding rod outside of the building, but the effectiveness of the ground is unknown. Static electricity can build up in the dry, cold Barrow climate which could destroy delicate electronic equipment.

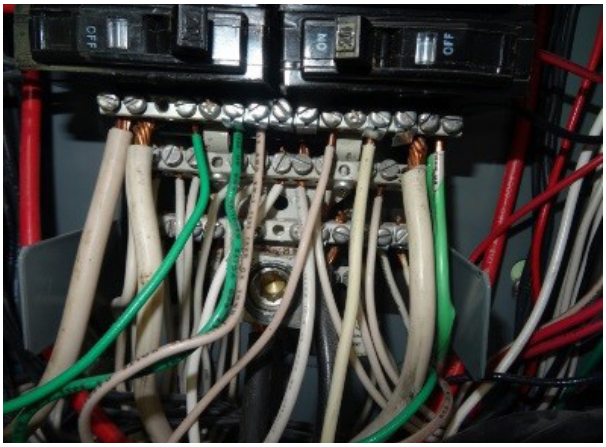
RECOMMENDATIONS

- Rewire the panels to provide separation of grounds and neutrals to the electrical service entrance. Also, test the ground circuit to assure that an adequate ground is provided per NEC requirements. If inadequate grounding is discovered, add additional ground rods until adequate grounding is attained.
- Provide static grounded mats at all electronic equipment to reduce the potential of static arcing at equipment.

Electrical Systems - Power and Wiring

There was a second distribution panel installed within the last 10 years to help reduce the congestion at the main distribution panel. That panel appears to be wired to current code, but the original panel is not wired to current code, with some obvious issues, including:

- There is no separate ground wire pulled to all grounded devices, such as receptacles. The ground is currently being derived from the conduit itself, which was permitted at the time that the building was originally wired.



Grounding rod (left); Grounds and neutrals tied together at panel (right)

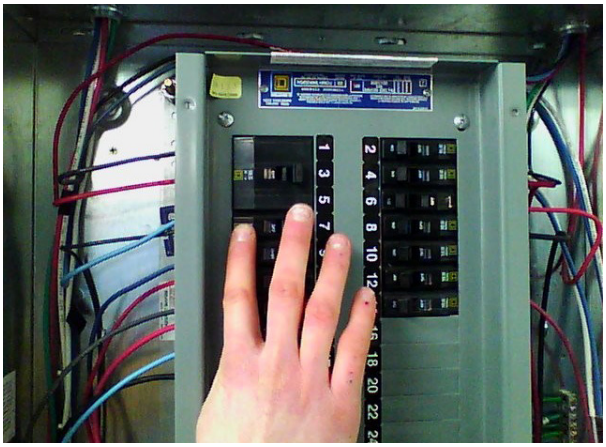
- All neutrals and grounds are tied together on the same buss at the original MDP panel, and not at the service entrance enclosure per NEC 250.
- There are insufficient circuits available for all of the instruments, so staff complains of overloaded circuits such that they have to re-balance the loads to avoid tripping of circuits. While the instruments have changed over the years to reflect current research requirements, the power circuits have not changed.
- The three phase wiring color coding at the panel board is not consistent with the color coding requirements of the NEC for 120/208 volt three phase systems.
- The wiring for the circuits at the panels are not labeled as to the loads that are being fed.
- One circuit was found to be warmer than the others, but the temperature was not excessive, so no further work is suggested. The warmer breaker indicated it was carrying more load. No loose connections were observed, which would have a hot spot at the connection.

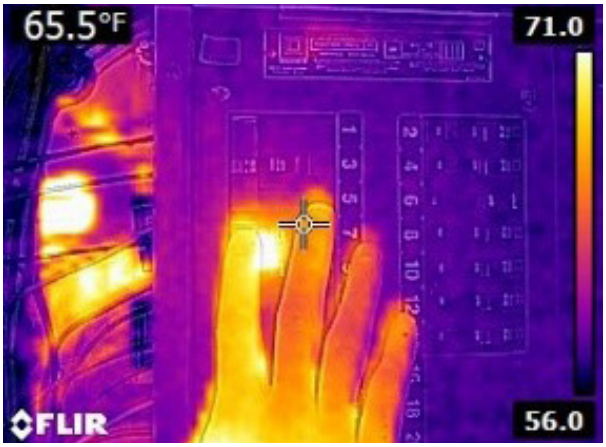
RECOMMENDATIONS

- It is recommended that the function of this building be changed to that of storage such that a new structure with properly wired circuits for all of the equipment can be provided. There is not sufficient room in the building for the required equipment, so re-wiring the building to add more circuits and outlets does not address the need for additional space.

Electrical Systems - Lighting

The building is lighted using older technology equipment that needs to be replaced, regardless of plans to repurpose the building, unless the building is demolished. Examples are:





Hot spot observed at panel breaker (about 71 degrees Fahrenheit)

- The interior lights are two tube, T-12, 4' lamps with magnetic ballasts.
- The exterior lights are incandescent lamps.
- There were only a few compact fluorescent lamps observed at some interior A-19 base fixtures.
- There was no emergency lighting noted to be installed that would illuminate the pathway to exits in the event of a power outage in the winter when no natural lighting is available.

RECOMMENDATIONS

- All interior fluorescent fixtures should be replaced with LED fixtures that would have an energy consumption reduction of at least 50%. All exterior incandescent lamps should be replaced with screw-in LED lamps for an estimated energy reduction of 4.5 times that of the incandescent lamps, with a life expectancy going from 700 hours for incandescent to 50,000 hours or more with LEDs. Also, the LEDs will work well even in the cold ambient temperatures experienced in Barrow.

Electrical Systems - Fire Alarm Detection Systems

The only fire alarm detection system at the facility consists of two ceiling mounted battery operated smoke detectors.

RECOMMENDATIONS

- If the building is kept in service, recommend hard wiring the fire smoke detectors, and possibly also installing a small fire alarm panel that can annunciate to an occupied space.

T-12 light fixture

Battery operated smoke detector

IT & Communications

There is a cable tray system that distributes IT circuits that technicians complain is a rat's nest of cables.

RECOMMENDATIONS

- Technicians are requesting that all IT circuits terminate in junction boxes to clean up the system.

Security Systems

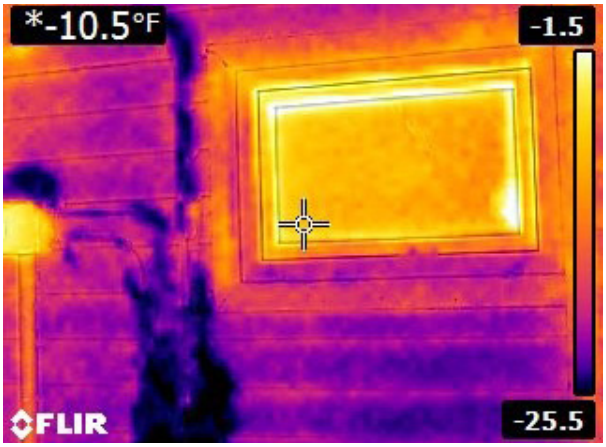
There are no security systems in this facility.

RECOMMENDATIONS

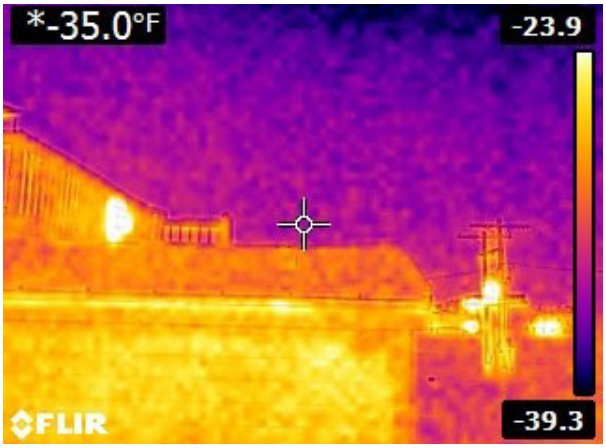
- A security system is recommended if NOAA feels that the future use of this building will include storage of valuable equipment or material that would justify the cost of a security system of some level. The location of the facility at the very end of the road past the USAF radar site does provide some protection from random theft or vandalism.

Energy Consumption and Evaluation

The building is not at all energy efficient, especially in terms of the lighting fixtures that are used. There are several infrared photos attached below that exemplify the heat loss from the building, but due do the fact that the equipment presently in the space generates a fair amount of heat, the addition of insulation will not have as fast of a payback period as would be the case of a building that does not house such high heat rejection equipment.



Area around window is 25 degrees warmer than siding



Siding and roof compared to deck above

Side of building with windows and doghouse below emitting heat

Conclusions

The Barrow Baseline Observatory was built in 1972 by the U.S. Navy as a temporary radio shelter. The Navy later donated the structure to NOAA. The 43 year old observatory has outlived its useful life. Nearly all the envelope systems are substandard or failing, the finishes worn, tired and in need of upgrade. The foundation condition is undetermined, mechanical and electrical systems are inadequate, staff accommodations non-existent, there is no fire protection and the space is too small to accommodate the scientific projects that need to be conducted at the facility.

Since NOAA first occupied the building the number of scientific programs conducted at the Barrow Observatory has tripled in number. The building is so crowded no additional programs can be accepted due to space limitations, electrical power and staff safety concerns. This inability to add needed projects is seriously limiting the ability of NOAA to meet the goals of the climate observations and monitoring air quality programs. The NOAA Barrow Observatory supports climate related research from universities and other agencies. The current demand of these organizations to initiate and conduct projects in the arctic cannot be met due to the condition of the facility. However, no new programs or measurements are being accepted.

A wide range of deficiencies were found during the investigation for this condition assessment. These deficiencies are building-wide and include, but are not limited to the following:

- Building insulation that provides less than half the thermal resistance currently recommended. It should be noted the Barrow Observatory is the northern most NOAA research facility in the U.S. The result of this deficiency is a highly inefficient energy use footprint.
- The roof system is failing and is not suitable for the arctic.
- The exterior doors are often not able to be locked due to building movement. The building has no security system.
- The building includes no mechanical ventilation resulting in poor indoor air quality.
- No potable water is provided. Staff melt snow for non-potable water used in the building.
- There are no sanitary facilities on site forcing staff to drive to facilities off site.
- The fire alarm system is comprised of battery operated smoke detectors that do not comply with current building codes.
- No fire protection is provided in the building.
- Both the lighting and IT systems are outdated and inefficient.

- The electrical system has no backup system, is overloaded and sub-standard for the current use.

No programming efforts were undertaken in conjunction with this report, however as a minimum the observatory should include a unisex toilet complying with accessibility guidelines, a small staff break area that includes a kitchenette with a refrigerator, a two compartment sink with running water and a microwave oven. A minimum of three workstations are required for staff, as well as a work space for office equipment. To support the building, a mechanical room needs to be added to provide space for ventilation and cooling.

Renovation and expansion have been considered, but the 43 year old wood frame building simply does not have the "bones" worth the expense of enhancement to meet current codes, standards and capacity requirements.

These findings lead the reviewers to recommend the development of a new structure that meets current standards and support the program's important mission.

Introduction

The preliminary project cost for the New NOAA OAR Atmospheric Baseline Observatory in Barrow, Alaska is $4.6 million. Costs are based on the preliminary concepts for a 2,400 SF structure as originally developed in 1992. Included is the prefabrication of modular building components in Seattle which are then barged to Barrow upon completion. In addition, construction will avoid the use of certain materials which are susceptible to off-gassing that could affect air samples taken at the observatory. (see Appendix). Costs also take into account escalation related to a three year construction period which will allow for the contractor to work around the Arctic environment.

Total preliminary construction cost is approximately $3.4 million. The remainder of the budget will be utilized for items including, but not limited to, A/E design fees and furniture, fixtures, and equipment.

Please note, this construction cost estimate is preliminary and may not reflect the refined and final estimates produced during the design phase. Additionally, the actual project budget will be determined by available funding sources.

The following assumptions were made:

- Cost is based on 2016 construction.
- Labor rates based on Davis Bacon; 60 hours per week
- The general contractor will have reasonable access to the site during normal working hours
- Anchorage-based contractor
- Cost included General and Subcontractor indirect costs and fees
- Exterior work will be done in summer conditions

The following items were excluded from the new facility cost:

- Renovation of existing building
- Hazardous material abatement

For comparison purposes, a cost estimate was developed for repair of the existing facility based on the deficiencies noted in the condition assessment. Total project cost is estimated at approximately $780,000.

The following items were excluded from the existing facility renovation costs:

- Hazardous material abatement

The summary of the cost estimates is included on the pages which follow. Detailed cost from which the summary costs are derived may be found in the Appendix of this document. The cost estimate was prepared for Facility Programming and Consulting by Estimations, Inc. of Anchorage, Alaska.

Summary Cost Estimate - New Facility

Description				$/SF	Totals
				Gross Area:	**2,400 SF**
A10 Foundations				$143.15	$343,551
A20 Basement Construction				$0.00	$0
A FOUNDATIONS				$143.15	$343,551
B10 Superstructure (Vertical, Floor & Roof)				$559.69	$1,343,260
B20 Exterior Enclosure				$38.79	$93,107
B30 Roofing				$3.41	$8,186
B SHELL				$601.90	$1,444,553
C10 Interior Construction				$0.00	$0
C20 Stairways				$13.85	$33,236
C30 Interior Finishes				$10.08	$24,199
C INTERIORS				$23.93	$57,435
D10 Conveying				$0.00	$0
D20 Plumbing Systems				$6.86	$16,472
D30 HVAC Systems				$12.11	$29,061
D40 Fire Protection				$0.84	$2,012
D50 Electrical System				$14.50	$34,800
D SYSTEMS				$34.31	$82,345
E10 Group I Equipment				$0.00	$0
E20 Furnishings				$0.00	$0
E EQUIPMENT				$0.00	$0
F10 Special Construction				$0.00	$0
F20 Selective Demolition				$0.00	$0
F2020 Hazmat Abatement (Excludes Hazmat Abatement)				$0.00	$0
F SPECIAL CONSTRUCTION & DEMOLITION				$0.00	$0
TOTAL BUILDING (A-F)				**$803.29**	**$1,927,884**
G10 Site Preparation				$35.42	$85,001
G20 Site Improvements				$0.00	$0
G30 Site Mechanical Utilities				$93.15	$223,561
G40 Site Electrical Utilities				$73.02	$175,245
TOTAL SITE CONSTRUCTION (G)				**$201.59**	**$483,807**
TOTAL BUILDING & SITE				**$1,004.87**	**$2,411,691**
General Conditions (Renovation)					
Project Management	7.00%			$70.34	$168,818
Project Equipment	4.00%			$40.20	$96,468
Mob/Demobilization	5.00%			$50.24	$120,585
Freight	89	TONS	$1,500.00	$55.37	$132,890
Room & Board	675	MDAY	$200.00	$56.25	$135,000
Contractor's Fee	12.00%			$120,584.58	$289,403
PLANNED CONSTRUCTION COST				**$1,397.86**	**$3,354,855**
FF&E					$100,000
Estimating Contingency				10%	$345,486
Construction Management Fees				8%	$304,027
Design and Engineering Fees				12%	$492,524
RECOMMENDED BUDGET				**$1,915.37**	**$4,596,892**

Summary Cost Estimate - Renovation of Existing Facility

Description		$/SF	Totals
		Gross Area:	**1,140 SF**
A - Site	No Recommendations	$0.00	$0
B1 - EPDM Roofing		$182.65	$208,226
B2 - Exterior Doors & Frames		$11.48	$13,090
B3 - Exterior Siding		$74.53	$84,968
C1 - Pile Inspection		$2.52	$2,876
D1 - Entry Wall Repair		$1.37	$1,558
D2 - Replace Acoustic Panels		$10.28	$11,723
D3 - Flooring		$42.26	$48,182
D4 - Entry Flooring		$8.03	$9,155
E1 - Appliances & Equipment	No Recommendations	$0.00	$0
F1 - Heating	No Recommendations	$0.00	$0
F2 - Cooling		$12.06	$13,753
F3 - Ventilation	System Cannot Be Retrofit For The Building's Current Use	$0.00	$0
F4 - Domestic Water System	No Recommendations	$0.00	$0
F5 - Cold Water System	System Cannot Be Retrofit For The Building's Current Use	$0.00	$0
F6 - Waste Piping & Service	No Room In The Existing Building To Construct	$0.00	$0
F7 - Plumbing Fixtures	None Existing	$0.00	$0
F8 - Fire Protection System	Fire Extinguishers Only	$0.38	$429
G1 - Electrical Service		$230.78	$263,085
G2 - Bonding & Grounding		$3.73	$4,254
G3 - Power & Wiring	Insufficient Room In The Building To Correct Deficiencies	$0.00	$0
G4 - Lighting		$17.75	$20,234
H1 - Fire Alarm Detection System		$7.96	$9,071
I1 - IT & Communications		$10.21	$11,636
J1 - Security Systems		$5.76	$6,563
K1 - Energy Consumption Evaluation	No Recommendations	$0.00	$0
Total Cost			**$708,803**
Estimating Contingency		10%	$70,880
RECOMMENDED BUDGET			**$779,683**

SKA

Summary Page 1 of 1

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List of Banned Construction Materials

Due to the nature of research and data collection conducted at the Atmospheric Baseline Observatory, the following construction materials shall be banned from any materials utilized in new construction or renovation projects at this property in Barrow, Alaska.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Oceanic and Atmospheric Research
Earth System Research Laboratory
325 Broadway – David Skaggs Research Center
Boulder, Colorado 80303-3337

Banned Construction Materials List

(Current as of October 2014)

- **Chlorofluorocarbons (CFCs):**
  Used as refrigerants, solvents, foam blowing agents, aerosol propellants, and heat exchange medium (no longer manufactured in the U.S.)

Molecule:	Name:	Commonly known as:
CCl_3F	trichlorofluoromethane	CFC-11, R-11, Freon-11
CCl_2F_2	dichlorodifluoromethane	CFC-12, R-12, Freon-12
$CClF_3$	chlorotrifluoromethane	CFC-13, R-13, Freon-13
CCl_2FCClF_2	trichlorotrifluoroethane	CFC-113, R-113, Freon-113
$CClF_2CClF_2$	1,2-dichlorotetrafluoroethane	CFC-114, R-114
$CClF_2CF_3$	1-chloro-1,1,2,2,2-pentafluoroethane	CFC-115, R-115

- **Hydrochlorofluorocarbons (HCFCs):**
  Used as refrigerants, solvents, foam blowing agents, aerosol propellants, and heat exchange medium

Molecule:	Name:	Commonly known as:
$CHCl_2F$	dichlorofluormethane	HCFC-21, R-21
$CHClF_2$	chlorodifluoromethane	HCFC-22, R-22
CF_3CHClF	chlorotetrafluoroethane	HCFC-124, R-124
CCl_2FCH_3	dichlorofluoroethane	HCFC-141b, R-141b
$CClF_2CH_3$	chlorodifluoroethane	HCFC-142b, R-142b

- **Hydrofluorocarbons (HFCs):**
  Used as refrigerants, foam blowing agents, and aerosol propellants

Molecule:	Name:	Commonly known as:
CF_3CH_2F	tetrafluoroethane	HFC-134a, R-134a
CH_3CHF_2	difluoroethane	HFC-152a, R-152a
CHF_3	fluoroform	HFC-23, R-23, Freon-23
$C_2H_3F_3$	trifluoroethane	HFC-143a, R-143a
CF_3CHF_2	pentafluoroethane	HFC-125, R-125, Freon-125
$CF_3CH_2CF_3$	1,1,1,3,3,3-hexafluoropropane	HFC-236fa, R-236fa
$CF_3CH_2CF_2CH_3$	pentafluorobutane	HFC-265mfc, R-265mfc
C_3HF_7	heptafluoropropane	HFC-227ea, R-227ea
CH_2F_2	difluoromethane	HFC-32, R-32

- Or any refrigerants containing these chemicals, such as R-404a, R-507a, R-410a, R-407c

- **Perfluorinated Compounds (PFCs):**
  Used in production of Teflon and related fluorinated polymers, also been used to confer stain-resisting properties to fabrics

Molecule:	Name:	Commonly known as:
CF_4	tetrafluoromethane	carbon tetrafluoride, PFC-14
C_2F_6	hexafluoroethane	carbon hexafluoride, PFC-116
C_3F_8	octafluoropropane	R218, PFC-218

- **Halons:**
  Used in fire suppression and extinguishing systems

Molecule:	Name:	Commonly known as:
$CBrClF_2$	bromochlorodifluoromethane	halon-1211
$CBrF_3$	bromotrifluormethane	halon-1301
$CBrF_2CBrF_2$	1,2-dibromotetrafluoroethane	halon-2402, R-114B2

- **Chlorocarbons:**
  Used as solvents, cleaning agents, degreasing agents, and in other less common applications

Molecule:	Name:	Commonly known as:
CH_3Cl	chloromethane	methyl chloride
CH_2Cl_2	dichloromethane	methylene chloride
$CHCl_3$	trichloromethane	chloroform
CCl_4	tetrachloromethane	carbon tetrachloride
CH_3CCl_3	trichloroethane	methyl chloroform
C_2Cl_4	tetrachloroethene	perchloroethene
C_2HCl_3	trichloroethylene	trike, TCE, R-1120

- **Bromocarbons:**

Molecule:	Name:	Commonly known as:
CH_3Br	bromomethane	methyl bromide
CH_2Br_2	dibromomethane	methylene bromide
$CHBr_3$	tribromomethane	bromoform

- **Hydrocarbons:**
  Used predominantly as a combustible fuel source

Molecule:	Name:	Commonly known as:
C_2H_2	acetylene	acetylene
C_2H_6	ethane	ethane
C_3H_8	propane	propane
C_4H_{10}	butanes	isobutane, n-butane
C_5H_{12}	pentanes	isopentane, n-pentane
C_6H_{14}	hexane	hexane, n-hexane
C_7H_8	methylbenzene	toluene

- **Iodocarbons:**

Molecule:	Name:	Commonly known as:
CH_3I	iodomethane	methyl iodide

- **Others:**

Molecule:	Name:	Commonly known as:
N_2O	nitrous oxide	nitrous, laughing gas
SF_6	sulfur hexafluoride	(in electric transformers)
COS	carbonyl sulfide	carbonyl sulfide
C_6H_6	benzene	benzene
SO_2F_2	sulfuryl fluoride	vikane

Typical construction applications for these banned compounds include: "blue-board" and "pink-board" insulation sheets (most contain HCFCs), blown foam insulation containing prohibited chemicals as ingredients and/or propellants, solvents/sealants/adhesives using prohibited chemicals (examples include glues, caulks, paints, paint thinner, liquid nail, etc).

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Condition Assessment Checklists

The checklists on the following pages were utilized in the field by the survey team to assist in conducting the condition assessment of the existing Atmospheric Baseline Observatory. Checklists were completed for the following categories:

- Architectural
- Mechanical, Electrical, and Plumbing Systems

Site Information

Building SF (Gross)	
Building SF (Net rent)	
# Stories	
Site acreage	
Year constructed	1978
# Parking spaces	2 IN GARAGE
Sprinkled?	☐ Yes ☑ No
Estimated building height (FT)	14' to top of ROOF DECK
Estimated building perimeter (FT)	
Estimated office area (SF)	

SITE

Topography

General condition	☐ A ☐ B ☑ C ☐ D ☐ E
Site slopes downward	From: To:
Estimated elevation difference	
Slope	☑ Is relatively flat ☐ Is rolling
Other	

Flood Zone

General condition	☐ A ☐ B ☑ C ☐ D ☐ E
Zone A	☐ A ☐ AE ☐ AH ☐ AO ☐ A99 ☐ AR
Zone V	☐ V ☐ VE
Other zones	☐ X ☐ X (Shaded) ☐ D

Pavement

Parking

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
# Parking stalls	0
# ADA spaces (standard)	0
# ADA spaces (Van accessible)	0
Does striping exist?	☐ Yes ☑ No
Condition of striping	☐ A ☐ B ☐ C ☐ D ☐ E NONE

Estimated RUL	YEARS
Does seal coat exist?	☐ Yes ☑ No
Condition of striping	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Estimated RUL	YEARS

Asphalt

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Estimated area (SF)	
Does seal coat exist?	☐ Yes ☑ No
Condition of striping	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Estimated RUL	YEARS N/A

Concrete

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Estimated area (SF)	N/A

Truck Court Pavement

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Apron pavement	☐ Asphalt ☐ Concrete
Court depth (LF)	
Apron depth (LF)	

Hardscape

Sidewalks

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Type	☐ Concrete ☐ Asphalt ☐ Other NONE
Other (describe)	COMPACTED SAND/SILT

Exterior Plazas

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Type	☐ Concrete ☐ Asphalt ☐ Other NONE
Other (describe)	

Curbing

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Type	☐ Concrete ☐ Asphalt ☐ Other

CASCADE CHECKLIST – STRUCTURAL ONLY SITE, STATE

STRUCTURE

Foundation

Foundation

General condition	☐ A ☐ B ☐ C ☑ D ☐ E
Check if observed/present	☐ Plans provided ☑ Piles 8"-12" ROUND FREEZEBACK PILE ☐ H-pile type ☐ Steel pipe type ☐ Spot footings (Grid spacing:) ☐ Continuous spread footings (Thickness (FT):) ☐ Caissons (Grid spacing:) ☐ Grade beam footing (Location:)

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Basement/Crawlspace

Basement	☐ Yes ☐ No ☐ Partial NONE
Crawlspace	☐ Yes ☐ No ☐ Partial NONE

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Geotech

Check as appropriate	☑ Geotech info not available ☐ Geotech report reviewed ☐ Geotech soil and groundwater conditions described by POC

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Floors

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
☐ Slab on grade at basement	Thickness (in): WOOD FRAME WITH BATT INSULATION
☐ Slab on grade at first floor	Thickness (in): 3/8" PLYWOOD SOFFITS, 3/4" SUBFLOOR
☐ Slab at dock level	Thickness (in):

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Superstructure

System

CASCADE CHECKLIST – SITE ONLY SITE, ST

Other (describe)	

Retaining Walls

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Type	☐ Concrete ☐ Asphalt ☐ Other
Other (describe)	
Location	

Drainage

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Check if observed/present	☐ Catch basins ☐ Drainage ditch ☐ Dry well system under parking lot ☐ Retention basin (wet pond) ☐ Detention basin (dry pond)

General condition	☐ A ☐ B ☐ C ☑ D ☐ E
Butler-style building	☐ Yes ☐ No ☐ Partial
Seismic design	☐ Yes ☐ No ☐ Retrofit
System	☐ Open web steel girders/beams ☐ Wide-flanged girders/beams ☐ Built up plate ☐ Masonry load-bearing walls ☐ Heavy timber ☑ Other WOOD FRAME (TYPE V-B)

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Braced Frames

General condition	☐A ☐B ☐C ☐D ☐E
Braced frames	☐ Structural steel ☑ Sheer wall
Number	ALL EXTERIOR WALLS

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Connections

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Connections	☐ Bolted ☐ Welded ☑ Other
Describe	NAILS

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Bearings

General condition	☐ A ☐ B ☐ C ☐ D ☑ E
Bearings	☐ Expansion ☐ Fixed

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Columns

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Columns	☐ None ☐ Wide-flanged steel ☐ H-pile ☐ Steel tube ☐ Steel pipe ☐ Encased NONE
Concrete fill	☐ Yes ☑ No

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL

Describe				Pick		41T	

Upper Floor System

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Upper floor system	☐ None ☐ Full ☐ Mezzanine NONE
Number	
Construction	☐ Steel joists ☐ Steel beam ☐ Pre-cast concrete ☐ Wood beam ☐ Wood truss

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Roof System

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Roof system	☑ Gabled ☐ Cross gabled ☐ Mansard ☐ Hipped ☐ Cross hipped ☐ Pyramid ☐ Flat ☐ Shed ☐ Other
Roof system	☐ Open web steel joists ☐ Steel beam ☐ Steel truss ☐ Metal frame ☑ Wood frame ☑ Wood truss ☐ Other
Roof system	☐ Ribbed steel ☐ Plywood ☐ OSB ☐ Gypcrete ☐ Reinforced concrete ☐ Concrete plank ☐ Wood plank ☑ Standing seam ☑ Other 90 # FELTED ROOFING

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Wall Assembly

Shell

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Load bearing?	☐ Longitudinal ☐ Transverse ☑ Both
Insulated	☑ Yes ☐ No
Sandwich panel	☐ Yes ☐ No
Wall type	☐ Brick veneer ☐ Pre-cast panels ☐ Tilt-up panels ☐ Metal panels ☐ Vinyl panels ☐ Glass curtainwall ☐ CMU block ☐ CMU split-faced ☐ EIFS ☐ Aluminum siding ☑ Wood siding ☐ Vinyl siding
Stitch plates	☐ Yes ☑ No
Wall age	13 YEARS
Age of paint finish	3 YEARS
Paint finish condition	☐ A ☐ B ☐ C ☑ D ☐ E
Age of caulking	NONE
Caulking condition	☐ A ☐ B ☐ C ☐ D ☐ E ND

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Back-up Construction

General condition	☐ A ☐ B ☐ C ☑ D ☐ E
Load bearing?	☐ Longitudinal ☐ Transverse ☑ Both
Insulated	☑ Yes ☐ No R-19
Wall type	☑ Wood framing/sheathing ☐ Metal framing ☐ Steel framing ☐ Steel superstructure ☐ Brick ☐ Concrete tilt-up ☐ CMU block
Stitch plates	☐ Yes ☑ No
Wall age	13 YEARS
Age of paint finish	
Paint finish condition	☐ A ☐ B ☑ C ☐ D ☐ E
Age of caulking	NONE
Caulking condition	☐ A ☐ B ☐ C ☐ D ☐ E

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Soffits

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Soffit type	☐ Vinyl siding ☐ Aluminum siding ☐ Gypsum ☐ EIFS ☐ Cementitious plaster ☐ Other (desc)
Vented	☐ Yes ☐ No

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Fenestration

Windows – Fixed

General condition	☐ A ☑ B ☐ C ☐ D ☐ E
Window system	☐ Storefront ☐ Curtain wall ☑ Punched ☐ Ribbon ☐ Clerestory ☐ Other
Glazing	☐ Single glazed ☐ Doubled glazed ☑ Triple glazed
Glazing type	☐ Plate glass ☐ Wired glass ☐ Solar bronze glass ☐ Tinted glass ☑ Clear glass ☐ Bullet-proof glass ☐ Other (desc)
Framing type	☐ Painted aluminum ☐ Clear anodized ☐ Dark anodized ☐ Wood ☐ Steel ☑ Other (desc) VINYL
Condition of caulking	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Date of last re-caulking	
Attachment type	☑ Rubber gasket ☐ Plastic gasket ☐ Other
Condition of gaskets	☐ A ☐ B ☑ C ☐ D ☐ E
Date of last wet seal	
Quantity 6	Height 24" Width 36"

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Windows – Operable

General condition	☐ A ☑ B ☐ C ☐ D ☐ E
Window system	☐ Storefront ☐ Curtain wall ☑ Punched ☐ Ribbon ☐ Clerestory ☐ Other
Glazing	☐ Single glazed ☐ Doubled glazed ☑ Triple glazed
Glazing type	☐ Plate glass ☐ Wired glass ☐ Solar bronze glass

	☐ Tinted glass ☑ Clear glass ☐ Bullet-proof glass ☐ Other (desc)
Framing type	☐ Painted aluminum ☐ Clear anodized ☐ Dark anodized ☐ Wood ☐ Steel ☑ Other (desc) VINYL
Condition of caulking	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Date of last re-caulking	
Attachment type	☑ Rubber gasket ☐ Plastic gasket ☐ Other
Condition of gaskets	☐ A ☑ B ☐ C ☐ D ☐ E
Date of last wet seal	NONE

Quantity	6	Height 24		Width 36	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Exterior Doors

General condition	☐ A ☐ B ☐ C ☐ D ☑ E			
Exterior Door Type	**Total #**	**Single**	**Double**	**Revolving**
Fiberglass		☐	☐	☐
Aluminum w/ glass		☐	☐	☐
Vinyl		☐	☐	☐
Wood		☐	☐	☐
Hollow metal	4	☑	☐	☐

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Shell Hardening-Hurricane Shutters

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Hurricane shutter type	☐ Automatic roll down ☐ manual roll down ☐ accordion ☐ Bahama ☐ awning ☐ storm panel ☐ plywood ☐ Other
Other description	

Type	Condition	Qty	Height		Width	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Truck Doors

Standard Dock Doors

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Window system	☐ Vinyl surfaced ☐ Metal surfaced ☐ Other
Type	☐ Roll-up ☐ Push up ☐ Mechanically operated ☐ Other
Elevation	
Seals	
Restraints	
Back-up lights	
Bumpers	
Leveler type	☐ Hydraulic ☐ Mechanical ☐ Air power ☐ Other
Leveler number	
Knockout panels	☐ Yes ☐ No
Knockout quantity	

Quantity		Height		Width	
LF		Sq Ft			
Total LF		Total Sq Ft			

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Dock Doors – Oversize

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Window system	☐ Vinyl surfaced ☐ Metal surfaced ☐ Other
Type	☐ Roll-up ☐ Push up ☐ Mechanically operated ☐ Other
Elevation	
Seals	
Restraints	
Back-up lights	

Bumpers	NONE
Leveler type	☐ Hydraulic ☐ Mechanical ☐ Air power ☐ Other
Leveler number	
Knockout panels	☐ Yes ☐ No
Knockout quantity	

Quantity		Height		Width	
LF		Sq Ft			
Total LF		Total Sq Ft			

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Exterior Stairs

General condition	☐ A ☐ B ☐ C ☑ D ☐ E
Stair type	**Total #**
☑ Galvanized steel	STEEL GRATE/STRUT ON WOOD STRINGERS
☐ Concrete	
☐ Wood	
Check if observed/present	☑ Tread ☑ Open risers ☐ Closed risers ☑ Railings

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Roof Covering

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Roof access	☐ Interior ☐ Exterior ☑ None ☐ Other
Estimated roof area (SF)	
Estimated roof age (YR)	
Roof warranty year	
Insulation type	☐ Rigid board ☐ Concrete fill ☐ Recovery board ☐ Foam ☑ Batt/blanket ☐ None ☐ Other
Insulation construction	☑ Underside ☐ Sandwitch panel
Cover material	☐ EPDM ☐ PVC ☐ TPO ☐ Modified bitumen ☐ BUR ☐ Standing seam metal ☐ Asphalt shingles ☐ Wood shingles ☐ Slate shingles ☐ Clay tiles 90# ROLLED ASPHALT 24 GAUGE STANDING SEAM

Surface	☑ Mineral surface cap sheet ☐ Reflective coating ☐ Flood coat ☐ Gravel ballast ☐ Slag ☐ None
Surface construction	☐ Adhered sheet ☐ Mechanically attached ☑ Nailed
Thickless	(UOM):

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Roof Drainage

General condition	☐ A ☐ B ☐ C ☐ D ☑ E
Roof slope	☐ North-South ☐ South-North ☑ East-West ☑ West-East
Gutters	☐ North ☐ South ☐ East ☐ West NONE
Downspouts	☐ North ☐ South ☐ East ☐ West NONE
Discharge	☐ Façade ☐ Ground surface ☐ Splash blocks ☐ Stormwater system
Check if observed/present	☐ Scuppers NONE ☐ Internal roof drains NONE

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Skylights

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Skylight type	**Total #**
Flat	
Dome	
Pyramid	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

INTERIOR CONSTRUCTION

Interior Wall

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Wall type	☑ Partition ☐ Demising ☐ Structural ☐ Shaft ☐ Other (describe):
Wall studding	☐ Metal ☑ Wood ☐ None ☐ Not determined ☐ Other (describe):
Wall construction	☐ Gypsum board ☐ CMU ☐ Brick ☐ Pre-finished assembly ☐ Glass ☐ Plaster on mesh/lath ☐ Wood panel ☐ Other (describe): PAINTED PLYWOOD W/ BATTENS
Wall fire rating	☐ 30 min ☐ 45 min ☐ 1 hour ☐ 2 hour ☐ 3 hour ☐ 4 hour NONE ☐ Not determined
Wall finish	☑ Paint ☐ Wallpaper ☐ Fabric covering ☐ Stained ☐ Other (describe):
Wall finish condition	☐ A ☐ B ☑ C ☐ D ☐ E
RUL of wall finish (years)	5 YEARS

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Floor systems

Access floor

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Understructure	☐ Stringerless ☐ Corner lock ☐ Bolted stringer ☐ Truss ☐ Other (describe):
Floor panels	☐ Steel ☐ Steel with laminate ☐ Composite ☐ Concrete ☐ Floating aluminum ☐ Woodcore ☐ Other (describe):
Floor panel dimensions	☐ 24" x 24" ☐ Other (describe):
Perforated	☐ Yes ☐ No
Leak detection system	☐ Yes ☐ No
Underfloor air distribution	☐ Yes ☐ No

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Interior finishes

General condition	☐ A ☐ B ☐ C ☑ D ☑ E
Finish 1:	#:
Finish 2:	#:
Finish 3:	#:

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Special construction

General condition	☐ A ☐ B ☐ C ☐ D ☐ E

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Interior Stairs

General condition	☐ A ☐ B ☐ C ☐ D ☐ E NONE
Stair type	☐ Steel ☐ Wood ☐ Concrete ☐ Other
Stringer type	☐ Steel ☐ Wood ☐ Concrete ☐ Other
Assembly type	☐ Steel ☐ Wood ☐ Concrete ☐ Other ☐ Steel with concrete fill concrete assembly
Number of stairs	
Check if observed	☐ Treads ☐ Open risers ☐ Closed risers ☐ Railings

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Ceilings

General condition	☐ A ☐ B ☑ C ☐ D ☐ E
Ceiling type	☐ Drop ☑ Flat ☐ Other 12" GLUE ON ACT
Est. ceiling area	
Est. ceiling age	
Ceiling warranty year	
Cover material	☐ Panel ☐ Drywall ☐ Plaster ☑ Acoustic tiles ☐ Gypsum
Surface	☑ Paint ☐ Paper
Skylights	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

Interior doors

CASCADE CHECKLIST – INTERIOR CONSTRUCTION ONLY

SITE, STATE

General condition	☐ A ☐ B ☐ C ☑ D ☐ E
Number of doors	2
Door construction	☑ Hollow core 1 Door to A.C ☐ Solid core ☐ Glass ☑ Solid wood 1 Door to Storage ☐ LDF ☐ MDF ☐ Other (desc)
Door jambs	☑ Wood jamb ☐ Steel jamb ☐ Other (desc)
Door operation	☑ Swing ☐ Sliding ☐ Double leaf ☐ Other (desc)
Door fire rating	☐ 30 min ☐ 45 min ☐ 1 hour None ☐ 2 hour ☐ 3 hour ☐ 4 hour ☐ Not determined
Door surface	☑ Flat panel (1) ☑ Raised panel (1) ☐ Flush ☐ Other (desc)
Door finish	☐ Painted ☑ Stained (2) ☐ Unfinished ☐ Other (desc)
Door finish condition	☐ A ☑ B ☐ C ☐ D ☐ E
Electromagnetic door holder	☐ Yes ☑ No

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		41T	

3

CASCADE CHECKLIST- MECHANICAL ONLY

3.3 MECHANICAL

HVAC

Heat Generating Systems

Boilers

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Boiler type N/A	☐ Steam ☐ Hot water
Boiler element	☐ Firetube ☐ Watertube
Fabrication	☐ Steel ☐ Cast iron
Fuel type	☐ Electric ☐ Oil ☐ Natural gas ☐ Propane
Location	
Heating capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	
Make	
Model number	
Serial number	
Last inspection date	

Space Heaters - Glass infrared + 1 CUH @ Entry Ceiling, Elec

General condition	☐ A ☐ B ☒ C ☐ D ☐ E
Space heater type	☐ In-duct ☐ Suspended Wall mounted - TYP 3
Space heater element	☐ Hot water ☐ Steam
Fuel type	☒ Electric ☐ Oil ☐ Hot water ☐ Propane 3kW, 208 V
Location	Wall Heaters
Heating capacity	3kW UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	Unk
Make	Allied Precision Industries
Model number	3000-241
Serial number	N/A
Last inspection date	N/A

Furnace

General condition N/A	☐ A ☐ B ☐ C ☐ D ☐ E
Fuel type	☐ Electric ☐ Oil ☐ Natural gas ☐ Propane
Location	

CASCADE CHECKLIST- MECHANICAL ONLY

Heating capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	
Make	
Model number	
Serial number	
Last inspection date	

Infrared Heater See Space Heater

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
IR heater element	☐ Hot water ☐ Steam
Fuel type	☐ Electric ☐ Natural gas
Location	
Heating capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	
Make	
Model number	
Serial number	
Last inspection date	

MUA Unit N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
MUA type	☐ Roof mount ☐ Through wall
Fuel type	☐ Electric ☐ Natural gas
Location	
Heating capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	
Make	
Model number	
Serial number	
Last inspection date	

ARU

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
MUA type	☐ Floor mount
Fuel type	☐ Electric ☐ Natural gas
Location	
Heating capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date	
Make	

Mechanical, Electrical, and Plumbing Systems Checklist

CASCADE CHECKLIST- MECHANICAL ONLY

Model number	
Serial number	
Last inspection date	

Heating Coils N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Heating coil type	☐ AHU ☐ VAV	
Location		
Heating capacity		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		

Terminal Units N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Terminal unit type	☐ Induction ☐ Convector ☐ Radiator	
Terminal unit element	☐ Hot water ☐ Steam ☐ Electric	
Location		
Heating capacity		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		

Heat & Cooling Generating

Heat Pumps N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Heat pump type	☐ Water source ☐ Air source ☐ Ground source	
Location		
Heating capacity		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton
Cooling capacity		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		

3

CASCADE CHECKLIST- MECHANICAL ONLY

Refrigerant	

Package Units A/C unit w/ EIFM-3C Economizer w/exhaust

General condition	☐ A ☐ B ☒ C ☐ D ☐ E	
Package unit type	☒ Economizer ☐ Variable fan ☐ Constant fan	
Package unit Element	☒ Single zone ☐ Multi-zone w/Duct Damper	
Fuel type	☐ Gas ☐ Electric ☐ No heat	
Location	Closet	
Heating capacity	N/A	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton
Cooling capacity	2.5-3T	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton
Manufacture date		
Make	BARD	
Model number	UNK	
Serial number	UNK	
Last inspection date	UNK	
Refrigerant	R.22	

Cooling Generating Systems

Chillers N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Chiller type	☐ Liquid ☐ Air cooled	
Location		
Cooling capacity		UOM: ☐ BTU hour ☐ kW ☐ Ton
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		

Cooling Towers N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Cooling tower type	☐ Induced draft ☐ Forced draft ☐ Cross-flow	
Number of cells	(1-10)	
Location		
Cooling capacity		UOM: ☐ BTU hour ☐ kW ☐ Ton
Manufacture date		
Make		
Model number		
Serial number		

4

CASCADE CHECKLIST- MECHANICAL ONLY

Last inspection date	
Treatment system	

Condensers N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Fabrication	☐ Ductless ☐ AHU	
Heat rejection	☐ Air cooled ☐ Water cooled ☐ Glycol cooled	
Condenser type	☐ Direct expansion ☐ Chilled water ☐ Cross-flow	
Location		
Cooling capacity		UOM: ☐ BTU hour ☐ kW ☐ Ton
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		
Refrigerant type		

Swamp Cooler N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Swamp cooler type	☐ Fixed fiber ☐ Rotating ☐ Rigid sheet	
Location		
Cooling capacity		UOM: ☐ BTU hour ☐ kW ☐ Ton
Manufacture date		
Make		
Model number		
Serial number		
Last inspection date		
Treatment system		

HVAC Distribution

Air Handlers N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
AHU type	☐ Gas heat ☐ Electric heat ☐ No heat		
AHU element	☐ Hydronic ☐ DX		
Make			
Model number			
Serial Number			
Manufacture date		Age	
CFM			

CASCADE CHECKLIST- MECHANICAL ONLY

Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Location		
Last inspection date		
Last overhaul date		

Air Supply

General condition	☐ A ☐ B ☒ C ☐ D ☐ E
Check if observed/present	☒ Rigid duct ☐ Flexible duct ☐ VAV boxes ☐ Shut-off ☐ Fan-powered ☐ Direct discharge

Air Return

General condition	☐ A ☐ B ☒ C ☐ D ☐ E
Check if observed/present	☒ Rigid duct ☐ Flexible duct ☐ Grill at unit ☐ Open plenum ☐ to AHU ☐ to RTU

Fresh Air

General condition		☐ A ☐ B ☒ C ☐ D ☐ E		
Exchange rate		OPERABLE WINDOWS per Plan		
Package units N/A		☐ Yes ☐ No		
Operable windows		☐ Yes ☐ No		
Type	**# Units**	**Brand**	**Location**	**CFM**
Propeller fans				
Centrifugal fans				
Axial fans				

Exhaust N/A

General condition		☐ A ☐ B ☐ C ☐ D ☐ E		
Operable windows		☐ Yes ☐ No		
Type	**# Units**	**Brand**	**Location**	**CFM**
Sidewall fans				
Roof fans				
Ventilators				

Mechanical, Electrical, and Plumbing Systems Checklist

CASCADE CHECKLIST- MECHANICAL ONLY

Gravity vent				

Stream/Water N/A

General condition	☐A ☐B ☐C ☐D ☐E
Heat exchanger type	☐ Shell & tube ☐ Plate & frame
Valves for Pneu system	☐ Yes ☐ No
Describe	
Make	
Model number	
Serial Number	
Manufacture date	Age
CFM	
Output	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
Location	
Last inspection date	
Last overhaul date	

Pumps N/A

General condition	☐A ☐B ☐C ☐D ☐E
Pump brand	
Motor brand	
# of backups	GPM: HP:
Use	
Make	
Model number	
Serial Number	
Location	
Manufacture date	Age
Last inspection date	
Last overhaul date	

HVAC Controls

Pneumatics N/A

General condition	☐A ☐B ☐C ☐D ☐E
Check if observed/present	☐ Dampers ☐ Dryer ☐ Valves ☐ Pressure regulator ☐ Tank

7

CASCADE CHECKLIST- MECHANICAL ONLY

Describe tubing & compressor	

DDC None

General condition	☐A ☐B ☐C ☐D ☐E
DDC description	

BAS None

General condition	☐A ☐B ☐C ☐D ☐E
Make	
Model	
Web based	☐ Yes ☐ No
Age	
Managed equipment	
Supporting equipment	

EMS None

General condition	☐A ☐B ☐C ☐D ☐E
Make	
Model	
Web based	☐ Yes ☐ No
Age	
Managed equipment	
Supporting equipment	

Thermostats

General condition	☐A ☐B ☐C ☒D ☐E
Check if observed/present	☒ Individual 2x ☐ Programmable ☐ Standard ☐ Integral ☐ Other

Compressed Air Systems N/A

General condition	☐A ☐B ☐C ☐D ☐E
Type	
Model number	
Serial Number	

8

CASCADE CHECKLIST- MECHANICAL ONLY

CFM		HP:
Use		
Location		
Manufacture date		
Last inspection date		
Last overhaul date		

Other HVAC

Air Curtain N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Heated	☐ Yes ☐ No		
Make			
Model number			
Serial Number			
Manufacture date		Age	
Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton	
Location			
Last inspection date			
Last overhaul date			

Air Purifier N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Make			
Model number			
Serial Number			
Manufacture date		Age	
Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton	
Location			
Last inspection date			
Last overhaul date			

Dust/Fume Collector N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Make			
Model number			
Serial Number			
Manufacture date		Age	
Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton	
Location			

CASCADE CHECKLIST- MECHANICAL ONLY

Last inspection date	
Last overhaul date	

Spray Booth/Ventilation System N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Make			
Model number			
Serial Number			
Manufacture date		Age	
Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton	
Location			
Last inspection date			
Last overhaul date			

Commercial Equipment N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Commercial equipment type			
Make			
Model number			
Serial Number			
Manufacture date		Age	
Output		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW ☐ Ton	
Location			
Last inspection date			
Last overhaul date			

CASCADE CHECKLIST- MECHANICAL ONLY

3.3 PLUMBING

Domestic Water Distribution No Domestic Water Piping: 1 TANK

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Sanitary	☐ Gravity feed ☐ Sewage ejectors Drains to Bucket
Description	Bucket Evaporator
Sanitary pipe NONE	☐ Copper ☐ Galvanized steel ☐ Black iron ☐ PVC ☐ Brass
Sewer system NONE	☐ Municipal ☐ Septic
Description	
Roof drains None	☐ Exterior to underground ☐ Exterior to ground surface ☐ Interior piping
Roof drainage material N/A	☐ Copper ☐ Galvanized steel ☐ Black iron ☐ PVC ☐ Brass
Domestic system N/A	☐ Municipal ☐ Well
Description	
Domestic piping None	☐ Copper ☐ Galvanized steel ☐ Black iron ☐ PVC ☐ Brass
Domestic main None	☐ Loop around building
Located in	
Reported size	
Connection N/A	☐ At exterior wall ☐ In main mechanical room ☐ In sprinkler room ☐ Water service room
Meter location N/A	☐ Interior connection ☐ Exterior in vault/pit ☐ Remote read capable ☐ Other
Description	
BFP N/A	☐ Observed ☐ Not observed ☐ Reported ☐ None ☐ Other
BFP Description	

Hot Water None

Boilers

CASCADE CHECKLIST- MECHANICAL ONLY

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Observed status	☐ Observed ☐ Not observed ☐ Reported ☐ None ☐ Other
Description	
Fuel type	☐ Oil ☐ Gas ☐ Electric ☐ Propane
Make	
Model number	
Serial number	
Input capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
GPM:	Gallons:
Location	
Installation date	
Last inspection date	
Last overhaul date	

Domestic Hot Water Heaters None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Observed status	☐ Observed ☐ Not observed ☐ Reported ☐ None ☐ Other
Description	
Fuel type	☐ Oil ☐ Gas ☐ Electric ☐ Propane
Make	
Model number	
Serial number	
Input capacity	UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
GPM:	Gallons:
Location	
Installation date	
Last inspection date	
Last overhaul date	

Tankless Point-of-Use None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Observed status	☐ Observed ☐ Not observed ☐ Reported ☐ None ☐ Other
Description	
Fuel type	☐ Oil ☐ Gas ☐ Electric ☐ Propane

CASCADE CHECKLIST- MECHANICAL ONLY

Make		
Model number		
Serial number		
Input capacity		UOM: ☐ BTU hour ☐ CF/Minute ☐ kW
GPM:	Gallons:	
Location		
Installation date		
Last inspection date		
Last overhaul date		

Plumbing Fixtures

General condition	☐ A ☐ B ☐ C ☐ D ☐ E	
Tub None	Type: ☐ Enameled steel ☐ Fiberglass ☐ Marble ☐ Ceramic tile	Tub surround: ☐ Marble ☐ Ceramic tile ☐ Fiberlgass
Vanity None ☐ Cabinet with top	Sink type: ☐ Drop-in ☐ Integral	Top surround: ☐ Formica ☐ Cultured marble
Water closet None	Type: ☐ Tank ☐ Tankless	Mount: ☐ Wall ☐ Floor
Urinal None	Type: ☐ Wall hung ☐ Floor	

CASCADE CHECKLIST- MECHANICAL ONLY

3.4 LIFE & FIRE SAFETY

Fire Suppression None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Coverage	☐ Entire building ☐ None ☐ Partial
Describe partial	
System	☐ Wet system ☐ Foam system ☐ Preaction ☐ Dry system ☐ Chemical system ☐ Deluge
Describe dry system compressor	
Number of risers	BFP? ☐
Observed static pressure (typ)	
Observed GPM	
Maintenance contractor	
Central heads? ☐	ESFR? ☐
Location of main	
Muni pressure? ☐	Water tank? ☐ Location:
Tank material	
Tank capacity	
Tank serves	
Installation date	
Last inspection date	
Last overhaul date	

Fire Pump None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Type	☐ Electric ☐ Diesel
	☐ AST ☐ UST
Pump location	
Pump GPM:	HP:
Year installed	
Maintenance contractor	
Jockey pump	
GPM:	HP:
Condition	☐ A ☐ B ☐ C ☐ D ☐ E
Last inspection date	
Last overhaul date	

Standpipes

CASCADE CHECKLIST- MECHANICAL ONLY

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Stairwells	☐ Wet ☐ Dry
Hose cabinets in halls	☐ Wet ☐ Dry
Hose racks	☐ Wet ☐ Dry
Installation date	
Last inspection date	
Last overhaul date	

Extinguishers 1@ 20A: 120 B-C - NoTAG 1@ 1-A, 10B:C 4LBS MAX
Amerex A411 A-B-C New 2015

General condition	☐ A ☒ B ☐ C ☐ D ☐ E
Common areas	☐ Yes ☐ No
Date	
Tenant spaces	☐ Yes ☐ No
Date	NO TAG on either fire extinguisher
Maintenance contractor	None
Last inspection date	Not Tagged

Type	Location	Install Date	Recharge Date

Emergency Lighting None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E		
Last inspection date			
Type	**Backup**	**Location**	**Install Date**

Alarm Systems None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Alarm type	☐ Entire building ☐ Tenants have own system ☐ Local alarm bell only ☐ None
Location of main panel	
Brand/model	
Maintenance contractor	

CASCADE CHECKLIST- MECHANICAL ONLY

Panel monitors	☐ Pull stations ☐ Flow switches ☐ Tamper switches
Alarm locations	☐ Common areas ☐ Tenant spaces ☐ Stairs ☐ Restrooms ☐ Mechanical rooms
Alarms have strobes?	☐ Yes ☐ No
Alarm notifies	☐ Fire station ☐ Monitoring services ☐ Security desk
Estimated age of alarm (YR)	
Installation date	
Last inspection date	
Last overhaul date	

Smoke Detection 1 Smoke detector in ceiling main Rm, 1@ mAINT

General condition	☐ A ☒ B ☐ C ☐ D ☐ E
Observed?	☒ Yes ☐ No
In-duct?	☐ Yes ☒ No
Installation date	UNK
Last inspection date	Tested ok Battery Powered only
Last overhaul date	

Smoke Control N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Emergency smoke removal system?	☐ Yes ☐ No
Exit stair pressurizer?	☐ Yes ☐ No
Location	
Installation date	
Last inspection date	
Last overhaul date	

Fire Separation N/A

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Fire separation wall?	☐ Yes ☐ No
Fire ratings?	☐ Yes ☐ No
Description	
Installation date	
Last inspection date	

CASCADE CHECKLIST – ELECTRICAL ONLY SITE, STATE

ELECTRICAL

Interior lighting

General condition	☐ A ☐ B ☐ C ☐ D ☒ E
Fixture type	☐ Troffer style ☐ Linear ☐ High hat ☐ Sconce ☐ Track ☐ Suspended ☐ Wallpack emergency light ☐ Exit lights ☐ Other 21 each —
Number of bulbs	2 Tube T-12 Shop Lites, Surface, Mag Ballas
Fixture mount	☐ Recessed ☒ Ceiling mounted ☐ Wall mounted ☐ Other
Bulb type	☒ T-12 ☐ T-8 ☐ T-5 ☐ CFL ☐ Halogen ☐ Incandescent ☐ LED ☐ HID ☐ Metal halide ☐ HPS ☐ LPS
Motion	☐ Yes ☒ No
Fixture quantity	21
Location	Ceiling
Gen back-up	☐ Yes ☒ No

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Arctic Entry - Incandescant in Jelly Jar

Exterior Lighting

General condition	☐ A ☐ B ☐ C ☐ D ☒ E
Sufficient lighting provided?	☐ Yes ☒ No
Comment	-
Fixture type	☐ Pole-mounted ☒ Wall-pack ☐ Façade mounted ☐ Landscape ☐ Soffit
Fixture mount	☐ Metal pole ☐ Wooden pole ☐ Façade downlight ☒ Wall sconce ☐ Spotlight ☐ Floodlight ☐ Bollard
Bulb type	☐ Metal halide ☐ HPS ☐ LED ☐ Fluorescent ☐ CLF ☒ Incandescent
Quantity	2
Location of lighting	Entries

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

CASCADE CHECKLIST – ELECTRICAL ONLY SITE, STATE

Electrical Services

General condition	☐ A ☐ B ☐ C ☐ D ☒ E
Feed from transformer	
Transformer type	☐ Pad mount trans ☒ Pole mount trans – 1 ☐ Underground vault
# of meters	1
Meter location	At Pole, Below XFMR

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Main Distribution

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Location	☐ Dedicated electrical room ☒ Perimeter wall ☐ Mechanical room ☐ Penthouse ☐ Rear space ☐ Other
Amps 225	Volts 208 Phase 3
Wire	Age 43 YRS
Last Inspection Date	UNK
Manufacturer	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Electrical Distribution

General condition	☐ A ☐ B ☐ C ☐ D ☒ E
Type	Conduits
Location	Surface
Amps	Volts 208 Phase 3
Wire	Age 43
Last inspection date	
Last overhaul date	
Manufacturer	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

CASCADE CHECKLIST – ELECTRICAL ONLY SITE, STATE

Branch Wiring

General condition	☐ A ☐ B ☐ C ☐ D ☒ E
Conduit	☒ Metal ☐ BX ☐ NX ☐ PVC ☐ Romex ☐ Cloth insulation
Wiring	☒ Copper ☐ Aluminum ☐ Other (desc)
Installation date	existing
Last inspection date	
Last overhaul date	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Emergency Power

UPS

General condition		☐ A ☐ B ☐ C ☐ D ☐ E						
1	Make	Best - Lasted 20 minutes last test						
	Model	Eaton 5PS 500						
	Age	Batteries changed 2010						
	Location	Main Room						
2	Make	Small computer size						
	Model							
	Age							
	Location							

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Generator None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Make	
Hours	
Fuel	☐ Diesel ☐ Natural gas ☐ Propane
Tank	☐ AST ☐ UST ☐ Integral
kW:	kVa: PF:
Transfer switch	☐ Auto ☐ Manual
Equipment served	
Installation date	
Maintenance contractor	
Frequency of exercise	☐ Weekly ☐ Bi-weekly ☐ Monthly
Load test	☐ Semi-annual ☐ Annual

3

CASCADE CHECKLIST – ELECTRICAL ONLY SITE, STATE

Owned and maintained by	☐ Tenant ☐ Landlord
Location	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Fuel Distribution/Storage Tanks None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Tank type	☐ AST ☐ UST ☐ Integral
Check if observed/present	☐ Cathode protection ☐ Spill protection ☐ Leak detection equipped
Tank capacity	
Location	
Last inspection date	
Scheduled removal	

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

Security - Lock on door, webcam

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Electronic security system	☐ Yes ☐ No
Security company	
Control panel make	
Control panel model	
Perimeter protection	☐ Yes ☐ No
Installation date	
Interior protection	☐ Yes ☐ No
Installation date	
Video surveillance system	☐ Yes ☐ No
Installation date	
Electronic access system	☐ Yes ☐ No
Installation date	
Check if observed/present	☐ Motion detector ☐ Glass break detector ☐ Floor mat detector ☐ Emergency keys

Maintenance Item	Location	Qty	U/M	Priority	RUL	Secondary priority	EUL
Describe				Pick		38T	

4

Mechanical, Electrical, and Plumbing Systems Checklist

LIFE & FIRE SAFETY

Fire Suppression None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Coverage	☐ Entire building ☐ None ☐ Partial
Describe partial	
System	☐ Wet system ☐ Foam system ☐ Preaction ☐ Dry system ☐ Chemical system ☐ Deluge
Describe dry system compressor	
Number of risers	BFP? ☐
Observed static pressure (typ)	
Observed GPM	
Maintenance contractor	
Central heads? ☐	ESFR? ☐
Location of main	
Muni pressure? ☐	Water tank? ☐ Location:
Tank material	
Tank capacity	
Tank serves	
Installation date	
Last inspection date	
Last overhaul date	

Fire Pump None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Type	☐ Electric ☐ Diesel
	☐ AST ☐ UST
Pump location	
Pump GPM:	HP:
Year installed	
Maintenance contractor	
Jockey pump	
GPM:	HP:
Condition	☐ A ☐ B ☐ C ☐ D ☐ E
Last inspection date	
Last overhaul date	

Standpipes None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Stairwells	☐ Wet ☐ Dry
Hose cabinets in halls	☐ Wet ☐ Dry
Hose racks	☐ Wet ☐ Dry
Installation date	
Last inspection date	
Last overhaul date	

Extinguishers 2

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Common areas	☐ Yes ☐ No
Date	
Tenant spaces	☐ Yes ☐ No
Date	
Maintenance contractor	
Last inspection date	

Type	Location	Install Date	Recharge Date

Emergency Lighting None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Last inspection date	

Type	Backup	Location	Install Date

Alarm Systems None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Alarm type	☐ Entire building ☐ Tenants have own system ☐ Local alarm bell only ☐ None
Location of main panel	
Brand/model	
Maintenance contractor	
Panel monitors	☐ Pull stations ☐ Flow switches ☐ Tamper switches
Alarm locations	☐ Common areas ☐ Tenant spaces ☐ Stairs ☐ Restrooms ☐ Mechanical rooms
Alarms have strobes?	☐ Yes ☐ No
Alarm notifies	☐ Fire station ☐ Monitoring services ☐ Security desk
Estimated age of alarm (YR)	
Installation date	
Last inspection date	
Last overhaul date	

Fire Separation None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Fire separation wall?	☐ Yes ☐ No
Fire ratings?	☐ Yes ☐ No
Description	
Installation date	
Last inspection date	

Smoke Detection Battery (2)

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Observed?	☐ Yes ☐ No
In-duct?	☐ Yes ☐ No
Installation date	
Last inspection date	
Last overhaul date	

Smoke Control None

General condition	☐ A ☐ B ☐ C ☐ D ☐ E
Emergency smoke removal system?	☐ Yes ☐ No
Exit stair pressurizer?	☐ Yes ☐ No
Location	
Installation date	
Last inspection date	
Last overhaul date	

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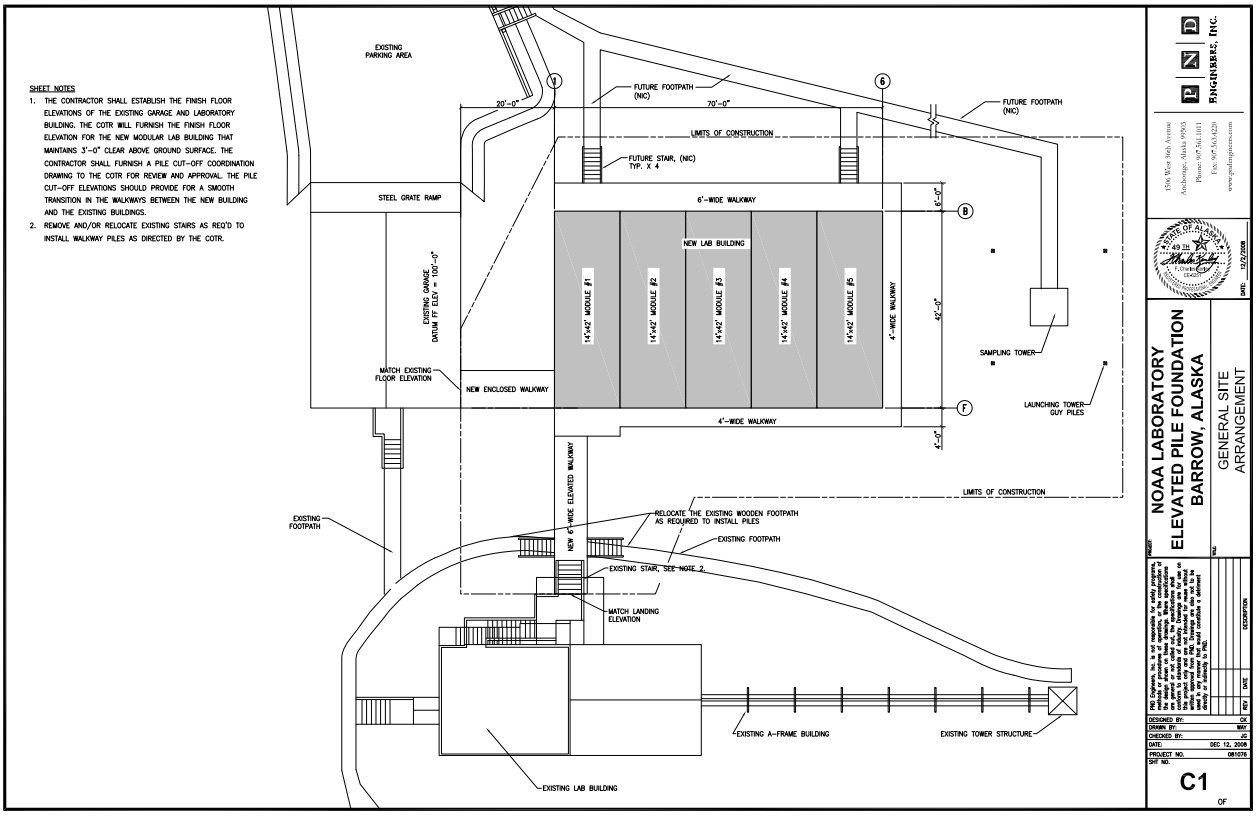
Detailed Cost Estimates

The following cost estimates were prepared for both a new, proposed facility and repairs to the existing facility based on deficiencies found during the existing facility condition assessment. The information which follows is the detail which is utilized to calculate the summaries found in Chapter 3 of this document. Cost estimates were completed for the following categories:

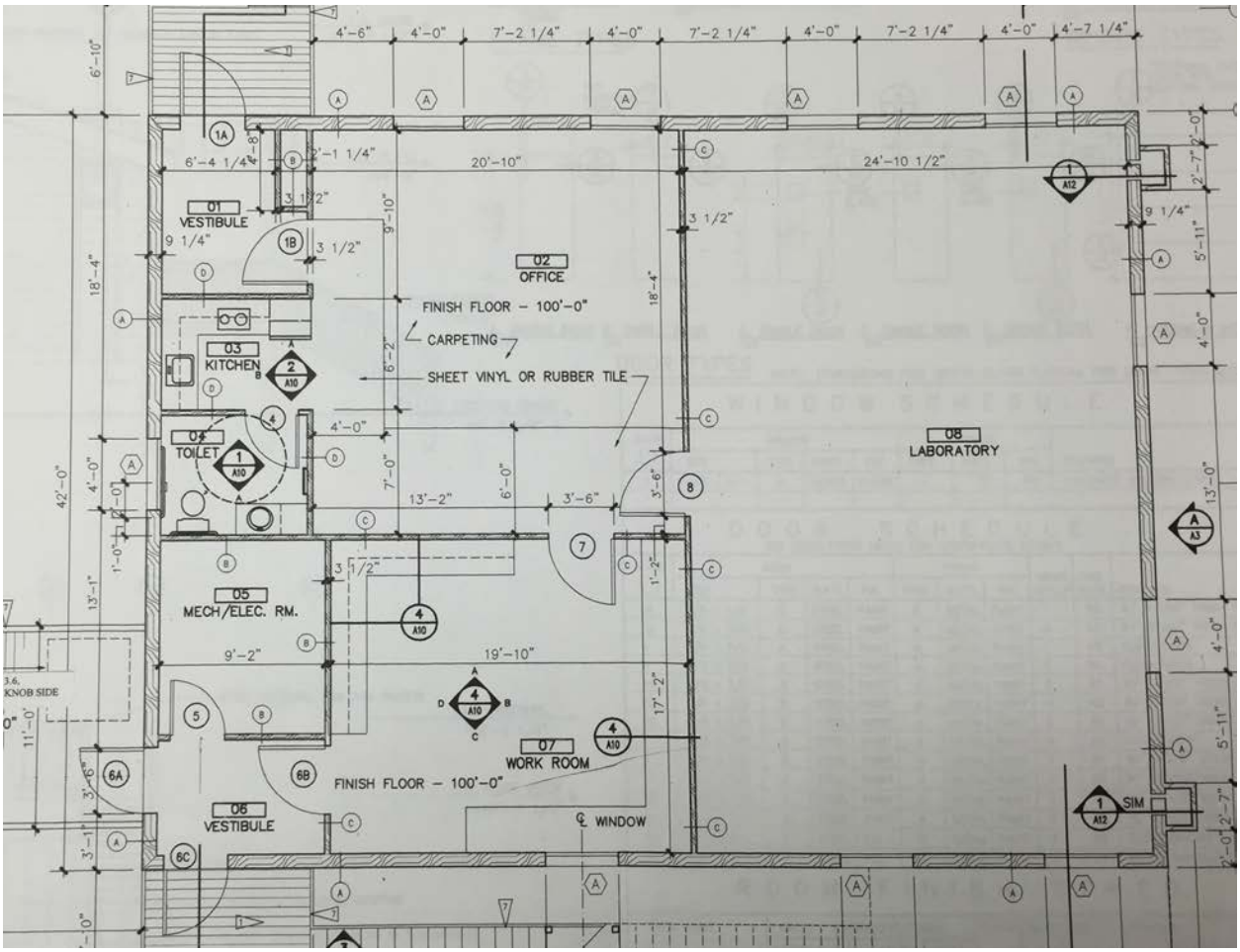
- New Facility
- Repairs to Existing Facility

Costs for the new facility were based on the conceptual drawings below and on the following page.

Conceptual Site Plan



Conceptual Floor Plan



NOAA Barrow Baseline Observatory
New Facility
Prepared for Facility Programming and Consulting by Cost Estimations

Construction Cost Estimate
Concept Submittal
April 28, 2015

Description			$/SF	Totals
			Gross Area:	**2,400 SF**
A10 Foundations			$143.15	$343,551
A20 Basement Construction			$0.00	$0
A FOUNDATIONS			$143.15	$343,551
B10 Superstructure (Vertical, Floor & Roof)			$559.69	$1,343,260
B20 Exterior Enclosure			$38.79	$93,107
B30 Roofing			$3.41	$8,186
B SHELL			$601.90	$1,444,553
C10 Interior Construction			$0.00	$0
C20 Stairways			$13.85	$33,236
C30 Interior Finishes			$10.08	$24,199
C INTERIORS			$23.93	$57,435
D10 Conveying			$0.00	$0
D20 Plumbing Systems			$6.86	$16,472
D30 HVAC Systems			$12.11	$29,061
D40 Fire Protection			$0.84	$2,012
D50 Electrical System			$14.50	$34,800
D SYSTEMS			$34.31	$82,345
E10 Group I Equipment			$0.00	$0
E20 Furnishings			$0.00	$0
E EQUIPMENT			$0.00	$0
F10 Special Construction			$0.00	$0
F20 Selective Demolition			$0.00	$0
F2020 Hazmat Abatement (Excludes Hazmat Abatement)			$0.00	$0
F SPECIAL CONSTRUCTION & DEMOLITION			$0.00	$0
TOTAL BUILDING (A-F)			**$803.29**	**$1,927,884**
G10 Site Preparation			$35.42	$85,001
G20 Site Improvements			$0.00	$0
G30 Site Mechanical Utilities			$93.15	$223,561
G40 Site Electrical Utilities			$73.02	$175,245
TOTAL SITE CONSTRUCTION (G)			**$201.59**	**$483,807**
TOTAL BUILDING & SITE			**$1,004.87**	**$2,411,691**
General Conditions (Renovation)				
Project Management	7.00%		$70.34	$168,818
Project Equipment	4.00%		$40.20	$96,468
Mob/Demobilization	5.00%		$50.24	$120,585
Freight	89 TONS	$1,500.00	$55.37	$132,890
Room & Board	675 MDAY	$200.00	$56.25	$135,000
Contractor's Fee	12.00%		$120,584.58	$289,403
PLANNED CONSTRUCTION COST			**$1,397.86**	**$3,354,855**
FF&E				$100,000
Estimating Contingency			10%	$345,486
Construction Management Fees			8%	$304,027
Design and Engineering Fees			12%	$492,524
RECOMMENDED BUDGET			**$1,915.37**	**$4,596,892**

Cost Estimate - New Facility

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
New Facility — **Concept Submittal**
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
1	**A10 Foundations**				
2					
3	**8x8 Wood Piling**	**64**	**EA**		
4	Drilling Cost	160	HRS	$940.87	$150,539
5	Wood Piling, 8x8 22'L	64	EA	$465.61	$29,799
6	Frost Bond Break, 3 Layers Poly Film	1,025	SF	$1.51	$1,550
7	Field Applied Preservative at Cutoff	64	EA	$39.92	$2,555
8	Slurry, Material	189	CY	$234.00	$44,307
9	Slurry, Bracing and Freeze Back	192	HRS	$140.16	$26,910
10	Thermocouple Conduit 1" PVC	126	LF	$2.99	$377
11	#4 Copper Ground	1,920	LF	$3.29	$6,310
12	Piling Cap, Steel	64	EA	$201.91	$12,922
13	Layout and Templates	1	LS	$5,681.00	$5,681
14	Surveying Of Pile Locations	1	LS	$6,936.00	$6,936
15					
16	**Walkway, Ongrade (6'W 12'T 100'L)**				
17	Piling 2 per 12 LF of walk	18	EA	$3,092.50	$55,665
18					
19					
20					
21	**Subtotal: A10 Foundations**				**$343,551**
22					
23					
24					
25	**B10 Superstructure**				
26					
27	Pre-Fabricated Modules complete, with mechanical, Electrical and finishes, FOB Seattle.	2,400	SF	$400.00	$960,000
28	Shipping on Modules	5	EA	$20,000.00	$100,000
29	Placement of Modules	5	EA	$13,422.00	$67,110
30	Stitching of Modules	5	EA	$6,614.80	$33,074
31					
32	**Pile Caps, Decking and Railings**				
33	Pile Caps 6-3/4x15 GLB	5,079	BF	$3.64	$18,473
34	Deck Stringers, #1 D.F-L, Treated	2,384	BF	$2.85	$6,805
35	Stair Stringers, #1 D.F-L, Treated	480	BF	$2.85	$1,370
36	Decking, Fiberglass	1,135	SF		
37	Railings	264	LF	$258.07	$68,131
38					
39	**Walkway, Ongrade (6'W 12'T 100'L)**				
40	Assume Structural Insulated Panels for all surfaces	3,800	SF	$23.24	$88,297
41					
42					
43	**Subtotal: B10 Superstructure**				**$1,343,260**
44					
45					
46					
47	**B20 Exterior**				
48					
49	Included in Modular costs, see B10				
50					
51	**Walkway, Ongrade (6'W 12'T 100'L)**				
52	Metal Siding	2,400	SF	$19.08	$45,799
53	Windows	480	SF	$98.56	$47,308
54					
55					
56	**Subtotal: B20 Exterior**				**$93,107**
57					
58					
59					
60					
61					
62					
63					

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NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
New Facility — Concept Submittal
Prepared for Facility Programming and Consulting by Cost Estimations — April 28, 2015

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
64	**B30 Roofing**				
65					
66	Included in Modular costs, see B10				
67					
68	**Walkway, Ongrade (6'W 12'T 100'L)**				
69	Metal Roofing	700	SF	$11.69	$8,186
70					
71					
72	**Subtotal: B30 Roofing**				**$8,186**
73					
74					
75					
76	**C10 Interior Construction**				
77					
78	Included in Modular costs, see B10				
79					
80					
81	**Subtotal: C10 Interior Construction**				
82					
83					
84					
85	**C20 Stairways**				
86					
87	Exterior Stairs	5	EA	$6,647.20	$33,236
88					
89					
90	**Subtotal: C20 Stairways**				**$33,236**
91					
92					
93					
94	**C30 Interior Finishes**				
95					
96	Allow for Additional Finish Work on site	2,400	SF	$10.08	$24,199
97					
98					
99	**Subtotal: C30 Interior Finishes**				**$24,199**
100					
101					
102					
103	**D10 Conveying**		**NONE**		
104					
105					
106					
107	**Subtotal: D10 Conveying**				
108					
109					
110					
111	**D20 Plumbing Systems**				
112	Stitching Modules	5	EA	$3,294.40	$16,472
113	Plumbing Fixtures Included in Modular Costs				
114					
115	**Subtotal: D20 Plumbing Systems**				**$16,472**
116					
117					
118					
119	**D30 HVAC Systems**				
120	Stitching Modules	5	EA	$3,294.40	$16,472
121	AC System, Site Installation for Condensers	1	EA	$12,589.00	$12,589
122	HVAC Distribution Included in Modular Costs				
123					
124	**Subtotal: D30 HVAC Systems**				**$29,061**
125					
126					

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Cost Estimate - New Facility

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
New Facility — Concept Submittal
Prepared for Facility Programming and Consulting by Cost Estimations — April 28, 2015

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
127					
128	**D40 Fire Protection**				
129					
130	Fire Extinguishers	12	EA	$167.67	$2,012
131					
132					
133	**Subtotal: D40 Fire Protection**				**$2,012**
134					
135					
136					
137	**D50 Electrical System**				
138	Stitching Modules	5	EA	$3,294.40	$16,472
139					
140	Walkway, Ongrade (6'W 12'T 100'L)				
141	Electric Heat	600	SF	$20.48	$12,290
142	Lighting	600	SF	$10.06	$6,038
143					
144					
145	**Subtotal: D50 Electrical System**				**$34,800**
146					
147					
148					
149	**E10 Group I Equipment**		**NONE**		
150					
151	**Subtotal: E10 Group I Equipment**				
152					
153					
154					
155	**E20 Furnishings**		**NONE**		
156					
157					
158	**Subtotal: E20 Furnishings**				
159					
160					
161					
162	**F20 Selective Demolition**		**NONE**		
163					
164					
165	**Subtotal: F20 Selective Demolition**				
166					
167					
168					
169	**G10 Site Preparation**				
170					
171	Pad Construction 2' Fill	710	CY	$75.78	$53,801
172	Insulation 4"	8,000	SF	$3.90	$31,200
173					
174					
175	**Subtotal: G10 Site Preparation**				**$85,001**
176					
177					
178					
179	**G20 Site Improvements**		**NONE**		
180					
181					
182	**Subtotal: G20 Site Improvements**				
183					
184					
185					
186					
187					
188					
189					

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NOAA Barrow Baseline Observatory
New Facility
Prepared for Facility Programming and Consulting by Cost Estimations

Construction Cost Estimate
Concept Submittal
April 28, 2015

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
190	**G30 Site Mechanical Utilities**				
191					
192	Holding Tank System for Water & Sewer	1	LS	$30,089.00	$30,089
193	Piping to Tanks	150	LF	$245.89	$36,883
194	Fuel Storage	1	LS	$156,589.00	$156,589
195					
196	**Subtotal: G30 Site Mechanical Utilities**				**$223,561**
197					
198					
199					
200	**G40 Site Electrical Utilities**				
201					
202	Intertie to Airforce	3,500	**LF**	$48.84	$170,951
203	Transfer Switch	1	**EA**	$4,294.00	$4,294
204					
205	**Subtotal: G40 Site Electrical Utilities**				**$175,245**
206					
207					

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Cost Estimate - Repairs to Existing Facility

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
Condition Survey
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Description		$/SF	Totals
		Gross Area:	**1,140 SF**
A - Site	No Recommendations	$0.00	$0
B1 - EPDM Roofing		$182.65	$208,226
B2 - Exterior Doors & Frames		$11.48	$13,090
B3 - Exterior Siding		$74.53	$84,968
C1 - Pile Inspection		$2.52	$2,876
D1 - Entry Wall Repair		$1.37	$1,558
D2 - Replace Acoustic Panels		$10.28	$11,723
D3 - Flooring		$42.26	$48,182
D4 - Entry Flooring		$8.03	$9,155
E1 - Appliances & Equipment	No Recommendations	$0.00	$0
F1 - Heating	No Recommendations	$0.00	$0
F2 - Cooling		$12.06	$13,753
F3 - Ventilation	System Cannot Be Retrofit For The Building's Current Use	$0.00	$0
F4 - Domestic Water System	No Recommendations	$0.00	$0
F5 - Cold Water System	System Cannot Be Retrofit For The Building's Current Use	$0.00	$0
F6 - Waste Piping & Service	No Room In The Existing Building To Construct	$0.00	$0
F7 - Plumbing Fixtures	None Existing	$0.00	$0
F8 - Fire Protection System	Fire Extinguishers Only	$0.38	$429
G1 - Electrical Service		$230.78	$263,085
G2 - Bonding & Grounding		$3.73	$4,254
G3 - Power & Wiring	Insufficient Room In The Building To Correct Deficiencies	$0.00	$0
G4 - Lighting		$17.75	$20,234
H1 - Fire Alarm Detection System		$7.96	$9,071
I1 - IT & Communications		$10.21	$11,636
J1 - Security Systems		$5.76	$6,563
K1 - Energy Consumption Evaluation	No Recommendations	$0.00	$0
Total Cost			**$708,803**
Estimating Contingency	10%		$70,880
RECOMMENDED BUDGET			**$779,683**

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Summary Page 1 of 1

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**

Condition Survey

Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
1	**A - Site**				
2					
3	No Recommendations				
4					
5					
6	**Subtotal: A - Site**				
7					
8					
9					
10	**B1 - EPDM Roofing**				
11					
12	**Roof Demolition**	**1,247**	**EA**	$3.07	$3,831
13	**EPDM Roof, 80Mil**	**1,247**	**SF**		
14	Coverboard	1,247	SF	$2.14	$2,667
15	EPDM Membrane, Fully Adhered	1,763	SF	$4.50	$7,936
16	XPS Insulation, 6"	7,482	BF	$4.10	$30,707
17	New Fascias	360	SF	$19.15	$6,894
18					
19	Remove Observation Deck	1	EA	$18,067.00	$18,067
20	Reconstruct Observation Deck	1	EA	$27,420.00	$27,420
21	Replace Handrails	216	LF	$308.92	$66,726
22					
23	Freight	32,210	LBS	$0.96	$30,922
24	Room & Board	51	MDAY	$256.00	$13,056
25					
26					
27					
28					
29	**Subtotal: B1 - EPDM Roofing**				**$208,226**
30					
31					
32					
33	**B2 - Exterior Doors & Frames**				
34					
35	Demo Doors and Frames	3	EA	$158.67	$476
36	Fiberglass Doors & Frames	3	EA	$1,469.33	$4,408
37	Exterior Door Hardware With Panic Devices	3	EA	$2,215.33	$6,646
38					
39	Freight	825	LBS	$0.96	$792
40	Room & Board	3	MDAY	$256.00	$768
41					
42					
43					
44					
45	**Subtotal: B2 - Exterior Doors & Frames**				**$13,090**
46					
47					
48					
49	**B3 - Exterior Siding**				
50					
51	**Exterior Walls**	**2,120**	**SF**		
52	Demo Siding	2,120	SF	$4.23	$8,975
53	6" Pre-Insulated Metal Panel	2,120	SF	$24.46	$51,857
54	Flashing at Windows and Doors	9	EA	$365.22	$3,287
55	Base & Misc Flashings	180	LF	$20.82	$3,748
56					
57	Freight	8,480	LBS	$0.96	$8,141
58	Room & Board	35	MDAY	$256.00	$8,960
59					
60					
61					
62	**Subtotal: B3 - Exterior Siding**				**$84,968**
63					
64					

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Cost Estimate - Repairs to Existing Facility

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
Condition Survey
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
65					
66	**C1 - Pile Inspection**				
67					
68	Piling Inspection	1	EA	$2,876.00	$2,876
69					
70					
71					
72	**Subtotal: C1 - Pile Inspection**				**$2,876**
73					
74					
75					
76	**D1 - Entry Wall Repair**				
77					
78	Patch & Paint Wall	60	SF	$20.73	$1,244
79					
80	Freight	60	LBS	$0.97	$58
81	Room & Board	1	MDAY	$256.00	$256
82					
83					
84	**Subtotal: D1 - Entry Wall Repair**				**$1,558**
85					
86					
87					
88	**D2 - Replace Acoustic Panels**				
89					
90	Demo Acoustical Panel	400	SF	$1.48	$593
91	New Acoustical Panels	400	SF	$22.71	$9,082
92					
93	Freight	1,600	LBS	$0.96	$1,536
94	Room & Board	2	MDAY	$256.00	$512
95					
96					
97	**Subtotal: D2 - Replace Acoustic Panels**				**$11,723**
98					
99					
100					
101	**D3 - Flooring**				
102					
103	Demo Carpet	960	SF	$10.84	$10,408
104	Sheet Vinyl Flooring	960	SF	$31.48	$30,225
105	Resilient Base	250	LF	$3.48	$869
106					
107	Freight	25	LBS	$0.96	$24
108	Room & Board	26	MDAY	$256.00	$6,656
109					
110					
111	**Subtotal: D3 - Flooring**				**$48,182**
112					
113					
114					
115	**D4 - Entry Flooring**				
116					
117	Demo Flooring	180	SF	$10.83	$1,950
118	Walkoff Carpet	180	SF	$31.49	$5,668
119	Resilient Base	72	LF	$3.49	$251
120					
121	Freight	7	LBS	$0.83	$6
122	Room & Board	5	MDAY	$256.00	$1,280
123					
124					
125					
126	**Subtotal: D4 - Entry Flooring**				**$9,155**
127					
128					

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NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
Condition Survey
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
129					
130	**E1 - Appliances & Equipment**				
131					
132	No Recommendations				
133					
134					
135	**Subtotal: E1 - Appliances & Equipment**				
136					
137					
138					
139	**F1 - Heating**				
140					
141	No Recommendations				
142					
143					
144	**Subtotal: F1 - Heating**				
145					
146					
147					
148	**F2 - Cooling**				
149					
150	Demo, Decommission AC Unit	1	EA	$1,975.00	$1,975
151	New AC Unit	3	TONS	$3,926.00	$11,778
152					
153					
154	**Subtotal: F2 - Cooling**				**$13,753**
155					
156					
157					
158	**F3 - Ventilation**				
159					
160	System Cannot Be Retrofit For The Building's Current Use				
161					
162					
163	**Subtotal: F3 - Ventilation**				
164					
165					
166					
167	**F4 - Domestic Water System**				
168					
169	No Recommendations				
170					
171	**Subtotal: F4 - Domestic Water System**				
172					
173					
174					
175	**F5 - Cold Water System**				
176					
177	System Cannot Be Retrofit For The Building's Current Use				
178					
179					
180	**Subtotal: F5 - Cold Water System**				
181					
182					
183					
184	**F6 - Waste Piping & Service**				
185					
186	No Room In The Existing Building To Construct				
187					
188					
189	**Subtotal: F6 - Waste Piping & Service**				
190					
191					

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Cost Estimate - Repairs to Existing Facility

NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
Condition Survey
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
192					
193	**F7 - Plumbing Fixtures**				
194					
195	None Existing				
196					
197					
198					
199					
200	**Subtotal: F7 - Plumbing Fixtures**				
201					
202					
203					
204	**F8 - Fire Protection System**				
205					
206	Replace Fire Extinguishers	2	EA	$214.50	$429
207					
208					
209					
210					
211	**Subtotal: F8 - Fire Protection System**				**$429**
212					
213					
214					
215	**G1 - Electrical Service**				
216					
217	Transfer Switch 225A	1	EA	$7,160.00	$7,160
218	Power Service To USAF Facility	3,500	LF	$62.52	$218,818
219					
220					
221					
222					
223	Freight	7,600	LBS	$1.25	$9,485
224	Room & Board	83	MDAY	$332.80	$27,622
225					
226					
227	**Subtotal: G1 - Electrical Service**				**$263,085**
228					
229					
230					
231	**G2 - Bonding & Grounding**				
232					
233	Correct Grounding	1	LS	$3,338.00	$3,338
234					
235					
236					
237					
238	Freight	200	LBS	$1.25	$250
239	Room & Board	2	MDAY	$333.00	$666
240					
241					
242	**Subtotal: G2 - Bonding & Grounding**				**$4,254**
243					
244					
245					
246	**G3 - Power & Wiring**				
247					
248	Insufficient Room In The Building To Correct Deficiencies				
249					
250					
251					
252					
253	**Subtotal: G3 - Power & Wiring**				
254					
255					

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NOAA Barrow Baseline Observatory — **Construction Cost Estimate**
Condition Survey
Prepared for Facility Programming and Consulting by Cost Estimations — **April 28, 2015**

Line No.	Description	Qty	UNITS	Unit Cost	Total Cost
256					
257	**G4 - Lighting**				
258					
259	Demo Light Fixtures	24	EA	$73.08	$1,754
260	New LED Light Fixtures	24	EA	$681.96	$16,367
261	Assume Re-Use Of Wiring				
262					
263					
264	Freight	360	LBS	$1.25	$449
265	Room & Board	5	MDAY	$332.80	$1,664
266					
267					
268	**Subtotal: G4 - Lighting**				**$20,234**
269					
270					
271					
272	**H1 - Fire Alarm Detection System**				
273					
274	Demo Fire Alarm Devices	2	EA	$36.50	$73
275	Add Fire Alarm System	1,140	SF	$6.39	$7,288
276					
277					
278	Freight	570	LBS	$1.25	$712
279	Room & Board	3	MDAY	$332.67	$998
280					
281					
282	**Subtotal: H1 - Fire Alarm Detection System**				**$9,071**
283					
284					
285					
286	**I1 - IT & Communications**				
287					
288	Terminate All Connections In Jboxes, Allowance	100	EA	$91.40	$9,140
289					
290					
291	Freight	400	LBS	$1.25	$499
292	Room & Board	6	MDAY	$332.83	$1,997
293					
294					
295	**Subtotal: I1 - IT & Communications**				**$11,636**
296					
297					
298					
299	**J1 - Security Systems**				
300					
301	Install Security System	1,140	SF	$4.55	$5,185
302					
303					
304	Freight	570	LBS	$1.25	$712
305	Room & Board	2	MDAY	$333.00	$666
306					
307					
308	**Subtotal: J1 - Security Systems**				**$6,563**
309					
310					
311					
312	**K1 - Energy Consumption Evaluation**				
313					
314	No Recommendations				
315					
316					
317	**Subtotal: K1 - Energy Consumption Evaluation**				
318					
319					

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