NATIONAL WEATHER SERVICE INSTRUCTION 30-4102
January 5, 2012

Maintenance, Logistics and Acquisition
***Facilities Management NWSPD* 30-41**

FACILITIES DESIGN

NOTICE: This publication is available at: http://www.nws.noaa.gov/directives/.

OPR: W/OPS1 (D. Jones) **Certified by:** W/OPS (M. Paese)
Type of Issuance: Routine

This Instruction implements Design areas contained in National Weather Service (NWS) Policy Document 30-41, Facilities Management.

SUMMARY OF REVISIONS: This instruction supersedes NWS Instruction 30-4102 dated January 2, 2003, and recertified on December 18, 2008. Changes include: Paragraph 2. deleted Project Development and Management (PDAM) and replaced with National Oceanic and Atmospheric Administration (NOAA) Administrative Order 217-104, Facility Capital Planning and Project Management Policy; paragraph 4.3 deleted Administrative Support Centers and replaced with NOAA's Project Planning and Management Division (PPMD) Regional Centers; 4.3.1 changed Acquisition Management Division to Architect/Engineering (A/E) Selection; 4.3.2 deleted Facilities and Logistics Division and replaced with Other Consultants; 4.4 changed to Acquisition Management Division; 4.5 added Real Property Management Division (RPMD); 4.6 added Safety and Environmental Compliance Office (SECO); 4.7 added Finance Division; 4.8 added Office of Program Planning and Integration; 5.4.2-5.4.5 added National Environmental Policy Act (NEPA) Decision; 5.7 added Advanced Meters; 8.5 added Final Design; 9.10 added Energy Efficiency; 9.11 added Potable Water and Irrigation; 9.12 added Hot Water; 9.13 added Data Center/Rooms; 9.9 deleted reference to Department of Justice Vulnerability Assessment and replaced with Physical Security Criteria for Federal Facilities, a Homeland Security Interagency Security Committee (ISC) Standard; 10. References were updated to include the Department of Commerce (DOC)'s Strategic Sustainability Performance Plan; Energy Independence and Security Act of 2007 and Executive Order (EO) 13514, Federal Leadership in Environmental, Energy and Economic Performance.

Signed December 22, 2011
Mark S. Paese Date
Director, Office of Operational Systems

Facilities Design

Table of Contents: Page 2-3

1. Introduction....3

2. Purpose....3

3. Scope....3

4. Project Management....4
- 4.1 The Project Manager....4
- 4.2 Project Team Composition....4
- 4.3 PPMD....4
  - 4.3.1 A/E Selection....4
  - 4.3.2 Other Consultants....4
- 4.4 Acquisition Management Division....4
- 4.5 RPMD....5
- 4.6 SECO....5
- 4.7 The Finance Division.....5
- 4.8 Office of Program Planning and Integration (OPPI)....5

5. Building Codes and Standards....5
- 5.1 Local Authorities....5
- 5.2 Accessibility Compliance.....5
- 5.3 Energy Analysis and Design....5
- 5.4 NEPA/Historic Preservation....5
  - 5.4.1 Data Collection and Initial Agency Consultations....6
  - 5.4.2 Preliminary Draft NEPA Decision....6
  - 5.4.3 Draft NEPA Decision....6-7
  - 5.4.4 Preliminary Final NEPA Decision....7
  - 5.4.5 Final NEPA Decision....7
  - 5.4.6 Finding of No Significant Impact (FONSI) and Decision Support....7
- 5.5 Sustainable Design/Leadership in Energy and Environmental Design (LEED) . 7-8
- 5.6 Lightning Protection....8
- 5.7 Advanced Metering..... 8

6. AE Design Services/Deliverables....8
- 6.1 Drawings/Computer Aided Design Standards....8
- 6.2 Specifications....8
- 6.3 Cost Estimate/Life Cycle Cost (LLC).... 8-9

7. Fees and Fee Negotiation....9
- 7.1 Rule of Thumb....9
- 7.2 6 Percent Fee Limit....9
- 7.3 Design Modifications....9

8. Design Submittals....9
- 8.1 30-35 Percent Design.... 9-10

8.2 60-65 Percent Design....10
8.3 90-95 Percent Design....10
8.4 100 Percent Design....10
8.5 Final Design....10
8.6 On-board Review....10

9. Architectural/Engineering Design Disciplines....10
9.1 Civil....10-11
9.2 Landscape Architecture....10
9.3 Architecture....11
9.4 Interior Design....11
9.5 Structural....11
9.6 Mechanical (Heating Ventilation and Air Conditioning (HVAC)....11-12
9.7 Electrical....12
9.7.1 Emergency Power Systems....12-13
9.7.2 Uninterruptible Power Systems (UPS)....13
9.8 Fire Protection....13
9.9 Security....13
9.10 Energy Efficiency....14
9.11 Potable Water and Irrigation....14
9.12 Hot Water....14
9.13 Datacenter/rooms....14
10. References....14

Introduction. This instruction implements NWSPD 30-41, Facilities Management. In the early 1980s, the National Oceanic and Atmospheric Administration (NOAA) launched a major program to modernize the NWS based on new technology and knowledge in the sciences of meteorology and hydrology. Inherent in this process was phasing the existing field organization into a streamlined network of Weather Forecast Offices (WFOs) strategically located across the United States. Experience gained from the process of design is summarized in this instruction. These processes include development of design documents to achieve low LLC for future facilities.

1. Purpose. The purpose of this document is to implement NWSPD 30-41 in the area of Facilities Design. In addition, guidance provided in NOAA Administrative Order (NAO) 217-104, Facility Capital Planning and Project Management Policy, lists activities in the design phase.

2. Scope. This document covers the design phases in NAO 217-104 process and provides guidance for National Weather Service Headquarters (NWSH) Regional Headquarters and National Centers.

3. Project Management.

3.1 The Project Manager (PM). The NWS PM is responsible for scope, requirements definition, project approval, budgeting and schedules. The project manager monitors and coordinates the individual project activities with the team.

3.2 Project Team Composition. The project team comprises NWSH PM, the NWS Region Point of Contact (POC), each specific Regional Center for engineering, acquisition, real estate, environmental support, and any additional non-government firms hired to support the project.

3.3 PPMD Regional Centers (Kansas City/Seattle) Support. The NWS PM will coordinate with the PPMD project manager to develop and manage the design process based on the NWS scope, requirements, and available funding. In most cases the design effort will involve hiring an independent Architect and Engineering (A/E) firm to prepare the design. All designs will consider the U.S. Green Building Council energy saving criteria and strive for Leadership in Energy and Environmental Design (LEED) Silver Certification.

3.3.1 A/E Selection. The NWS and PPMD PMs will coordinate on selection of an A/E firm for design. The A/E Contractor is required to furnish design services including but not limited to: architectural, site planning, civil, structural, mechanical, electrical, fire protection engineering; interior and laboratory design; furniture, fittings, equipment identification and selection; and telecommunications/information systems, associated with the building design, site development, utility layout, commissioning, energy and water analysis and facility management systems as well as development of construction documents for a design-build contract award. Other related services which may be required to be performed under this contract include Bid, Construction, and Occupancy Phase services. A/E firms are selected based on the following criteria: Past Performance, Experience of Key Personnel, Capacity of firm (and subs) to accomplish the work, Specialized Experience, PM's Experience, Experience in Sustainable Design, and Communication ability with the government. When requested by the NWS or PPMD PM, the A/E designates an individual as the commissioning authority (CxA) to lead, review and oversee the completion of the commissioning process activities. This individual remains on the project until completion of the final commissioning report.

3.3.2 Other Consultants. Should need arise, other contractors may be engaged at the discretion of the NWS and PPMD PMs. Depending on the nature and complexity of a project, other specialized consultants may be needed for specialty projects, including but not limited to, laboratory programming, laboratory design, cost estimating, and communications.

3.4 Acquisition Management Division. The NWS PM will ensure funds are provided to the appropriate Acquisition Division via c-Request or Budget Operating Plan (BOP) to contract with the A/E firm for design. The Acquisition Division will perform contract officer (CO) functions using the Federal Acquisition Regulations (FAR). The assigned CO and contract specialist will be members of the project team for design and performs contract administration services to ensure compliance with the provisions of awarded design contracts as a part of its overall procurement service to its clients.

3.5 RPMD. This division administers the Department's real and personal property programs for all Commerce field offices. In the Design phase, as a member of the team, they ensure the property location is legally available for use by NWS for the requested structure.

3.6 SECO. This office evaluates and ensures all facilities comply with environmental rules and regulations. The assigned SECO member of the design project team will evaluate the site to ensure environmental compliance.

3.7 The Finance Division. This division provides financial management support services including administrative payments, analysis of financial data, budget formulation and execution, and accounting support for the design process.

3.8 OPPI. This office, through the role of the NOAA NEPA Coordinator, provides National Environmental Policy Act (NEPA) coordination and compliance services including technical support, review, and clearance of NEPA documents prepared for programs and projects.

4. Building Codes and Standards. Since codes and standards change, it is the A/E Contractor's responsibility to ensure the provisions and requirements of the latest adopted version/edition of each code are incorporated into the final design documents. If there are any questions regarding the implementation of applicable codes and standards, it is the A/E Contractor's responsibility to notify the Contracting Officer's Technical Representative (COTR) or delegated agent for direction on how to proceed.

4.1 Local authorities. Although NWS as a federal agency does not have to comply with local codes, NWS realizes its facilities are dependent on utilities and services provided by local agencies, such as fire protection services. Hence, NWS intends to comply with local codes and regulations to the maximum extent possible.

4.2 Accessibility Compliance. Reference the Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

4.3 Energy Analysis and Design. The NWS project manager will oversee energy analysis and design to ensure the most efficient and cost effective design. Energy-saving projects pay off in the long run. The Federal Energy Management Program (FEMP) recommends LLC analysis and evaluates the cost-effectiveness of energy and water conservation which is promulgated in 10 CFR 436, LLC Methodology and Procedures and conforms to provisions in the Federal Energy Management Improvement Act of 1988 and subsequent energy conservation legislation. In addition, LCC fulfills the requirements of Executive Order 13423/13514, Strengthening Federal Environmental, Energy, and Transportation Management.

4.4 NEPA / Historic Preservation. The environmental team member will evaluate the site and, if necessary, prepare the statement of work (SOW) and estimate cost to contract with an agency to perform NEPA. In some cases the environmental team member can complete the process without hiring an independent contractor. If an independent contractor is necessary, the NEPA contractor performs the following tasks:

4.4.1 Data Collection and Initial Agency Consultations. The NEPA contractor will participate in meetings with the project team to assemble data on the planned facility. The NEPA contractor will collect necessary and relevant information (e.g. floor space, a construction schedule, number of employees, activities to be housed) on the proposed facility from the NWS. The information will be assembled into a statement of purpose and need and a general (not site-specific) description of the proposed action for use in the categorical exclusion (CE), environmental assessment (EA) or environmental impact statement (EIS). Information on environmental conditions (e.g. sensitive environmental resources, soil and hydrologic conditions, flood hazards, habitats for protected species, historic resources, road access, and zoning) at the proposed location of the facility and its vicinity will also be assembled. This will include data on other

proposed development in the area. The NEPA contractor will conduct a field reconnaissance of the proposed location to obtain information. The NEPA contractor will also consult with local, state, and federal planning, environmental, and natural-resource agencies to identify their concerns and obtain background data. Finally, coordinate all NEPA actions with the NOAA SECO and PPI offices.

4.4.2 Preliminary Draft NEPA Decision. The NEPA contractor will prepare and submit to NWS an electronic copy of a preliminary draft decision (CE, EA or EIS) analyzing the proposed action alternative to the proposed action, and the no-action alternative. The decision will comply with Council on Environmental Quality guidelines for implementing NEPA (40 CFR 1500-1508) and NAO 216-6, Environmental Review Procedures for Implementing the NEPA. The full range of possible environmental impacts will be analyzed and feasible measures to reduce identified impacts to insignificant levels will be identified where necessary or desirable. Both individual direct and indirect impacts, from the implementation of the following alternative actions, and cumulative impacts, developed in the vicinity, will be analyzed for the various designs. The significance of each impact will be determined by using the significance criteria in NAO 216-6, for the following environmental issues: Air quality; drainage and water quality; energy consumption; environmental justice; farmland; flood plains; flora and fauna (threatened and endangered species); geology, soils, and mineral resources; historic and cultural resources; land-use compatibility and zoning; noise (construction and operation); socioeconomics; transportation; visual quality; wetlands; and wild and scenic rivers/wilderness areas. Special studies or consultations may be required in the areas of flora and fauna (e.g. endangered species surveys), and historic resources (archaeological survey). The Project Manager is responsible for conducting consultations regarding endangered species or historic resources as this responsibility may not be delegated to the NEPA contractor. An Environmental Due Diligence Assessment (EDDA) examines the potential for NWS to incur liability for environmental contamination at the property to be leased. This is set forth in requirements in Chapter 2 of the DOC Real Property Management Manual and American Society of Testing and Materials (ASTM) Standard E1527-97 -- Standard Practice for Environmental site Assessments: Phase 1 Environmental Site Assessment Process. Both preparation of an EDDA, and sampling or testing of media are to be included in the estimated cost. The EA identifies potential risks that may arise from exposure of construction workers or NWS personnel to contaminated natural media or hazardous building materials at the various site alternatives.

4.4.3 Draft NEPA Decision. The NEPA contractor will revise the preliminary draft decision report as necessary in response to comments from the NWS. Upon receiving NWS approval, the NEPA contractor will publish and distribute to interested members of the public and government agencies electronic copies of the draft NEPA decision report. Comments on the draft decision report will be accepted from the public for a defined period, typically 30 days for a public comment period.

4.4.4 Preliminary Final NEPA Decision. The NEPA contractor will collect and organize comments on the Draft EA received from the public and government agencies. Responses to those comments will be prepared and incorporated into the EA and the document will be revised as necessary to respond to those comments. OPPI review and concurrence with the Final NEPA Decision will be conducted by the Project Manager as this responsibility may not be delegated to the contractor. Copies of a Preliminary Final NEPA Decision Report will be submitted electronically to NWS for review and comment.

4.4.5 Final NEPA Decision. The NEPA contractor will revise the Preliminary Final EA, as necessary, in response to comments from the NWS. Upon receiving NWS approval, the NEPA contractor will publish and distribute to interested members of the public and government electronic copies of the Final NEPA Decision Report.

4.4.6 FONSI and Decision Support. The environmental team member or, when necessary, the NEPA contractor will prepare and submit to NWS in electronic form a draft FONSIFONSI as appropriate. The draft FONSI will comply with requirements set forth in NOAA Administrative Order 216-6. The NEPA contractor will assist NWS in distributing the FONSI and reply to questions or comments from the public concerning NWS' decision in this matter.

4.5 Sustainable Design/LEED. Sustainable, or Agreen@, building design embraces a Awhole building@ approach, in which the interdependence of building elements and systems are exploited to make it as energy efficient as possible. Sustainable design recognizes the impact of every design choice (window placement and type of cooling system for example) on the natural and cultural resources of the local, regional, and global environment. Sustainable design principles developed by Department of Energy (DOE), General Services Administration (GSA), and Department of Defense (DOD) will be incorporated into the requirements for all new construction and major renovation projects.

To measure the sustainability or Agreen-ness@ of a building, an industry standard performance-oriented system was developed by the U.S. Green Building Council (USGBC) called LEED. Each new construction or renovation project needs to be LEED registered and strive for a minimum LEED certification of a Silver rating in order to comply with the intent of Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance. See http://www.leedbuilding.org.

In addition to the LEED Silver rating, all new construction, major renovations, repairs or alterations are required to be built in accordance with the Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings. This requirement, referred to as the "Guiding Principles", requires that specific LEED credits be obtained. Contact the NWS OPS15, Facilities Management Branch, for the most current mandatory LEED credit list. For additional guidance, please refer to DOE's FEMP Guidance for Electric Metering in Federal Buildings dated February 3, 2006.

4.6 Lightning Protection. The design and installation of lightning protection systems apply to new and existing facilities. The standards guidelines to be followed are (1) NFPA 70 - National Electrical Code and (2) NFPA 780 - Standard for the Installation of Lightning Protection Systems. The National Weather Service facilities guidelines for the design and installation of lightning protection systems are shown in the manual "Lightning Protection, Grounding, Bonding, Shielding, and Surge Protection Requirements."

4.7 Advanced Metering. The design and installation of advanced meters and sub-meters are required for all new and existing facilities. These meters automatically record energy consumption and power quality data every minute and transmit this data via the internet to local and remote users. In addition to the utility company's building meter, the following advanced meters will be required: whole building (directly down stream from the utility's building meter),

HVAC systems, data room (two meters are required to determine and track the data room's power usage efficiency (PUE) by measuring the total power to support the data room and a separate meter to measure the consumption of only the Information Technology equipment.

5. AE Design Services/Deliverables. The project manager (i.e. PPMD or NWS, if not using PPMD) is responsible for preparing the SOW, cost estimate and then managing the selected A/E throughout the design process. The responsible project manager uses the following guidelines for design.

5.1 Drawings/Computer Aided Drawing (CAD) Standards. The A/E contractor develops all electronic drawings in a format which can be used directly (without conversion) by the appropriate AutoCAD Release for Windows. In addition, the A/E contractor ensures drawing files include all custom fonts or menus used to modify the drawings, and more importantly, all external references (i.e., XREFs) are included. Drawing representations need only be in two dimensions although three dimensional imaging is acceptable. In addition, the A/E contractor ensures layering is in accordance with the most current CAD Guidelines. Drawings are completed in detailing floor plan views, exterior elevations, building sections, system distributions, riser diagrams, and equipment description schedules. Each final working drawing and each submitted specification and calculation document is signed by, bear the seal of, and show the State Certificate Number of all Architects and Engineers who prepared the document or are responsible for its preparation.

5.2 Specifications. The A/E contractor provides preliminary working drawings and a draft of the final construction specifications using the Construction Specifications Institute (CSI) format and/or brand name references with sample catalog cuts and manufacturer's literature as required, to identify components, materials, performance and operating characteristics. The A/E Contractor submits final calculations for selection and sizing of all building features, systems, and equipment.

5.3 Cost Estimate/LCC. A preliminary Current Cost Estimate which consists of the Estimated Construction Costs and the Estimated Project Costs is submitted by the A/E Contractor. The cost estimates are based on a building systems approach using an itemized list of system components. The Estimated Construction Cost is based upon the construction costs at the midpoint of the construction period and includes the following items as a minimum: Building Costs (using Construction Specifications Institute format); On-site Development Costs; Off-site Development Costs; Environmental Protection Costs; Interior Build-out Costs; Equipment Costs (e.g., built-in freezers, laboratory benches, fume hoods.); Permits, Fees, Bonds, and Taxes; and Construction Contractors' Overhead and Profit. The Estimated Project Cost includes the following items as a minimum: Furniture, Fixtures, and Equipment Costs; Moving and Relocation Expenses; Land Acquisition Costs; Consultant Fees; Construction Management and Inspection Fees; Operations and Maintenance Training Costs; Contingencies; and Other Costs. Clearly define all contingencies and Construction Contractors' overhead and profit expenses with a brief justification statement. Life-Cycle Cost analysis looks at the initial investment and total cost of owning/leasing a facility. Life-cycle cost factors include initial investment, inflation (discount factor), time value of money, operating costs and maintenance costs.

6. Fees and Fee Negotiation. The acquisition Contracting Officer (CO) team member is responsible for fee negotiation and approval, and is the only team member who can make

contract changes involving fees or extensions.

6.1 Rule of Thumb. Generally, the A/E design fee for normal projects that are not particularly complex is about 10 percent of the construction cost, for projects that are between $0.5k and $5.0 million in construction cost. The higher the construction cost, the lower the percentage fee, and vice versa. Complex projects like laboratories and hospitals may require a higher fee (12 to 15 percent) since they require more man-hours to design.

6.2 6 Percent Fee Limit. The government imposes 6 percent limit on the (pure) design fee. Such limitation does not include A/E services outside design, such as feasibility studies, programming, conceptual studies, geotechnical investigation, topographical survey, environmental surveys, and A/E support during construction. The A/E fee has to be 6 percent of construction cost for pure design (i.e. 30 percent, 60 percent, 90 percent and 100 percent submissions).

6.3 Design Modifications. Modifications could be incorporated at any stage in the project. However, the more advanced the design is, the higher the cost to do a modification. Hence, it is best to do a good thorough programming and schematic design phases to avoid any modifications during the design development phase (60 percent) and the construction document phase (90 percent and 100 percent). Modifications during construction design phase are the most expensive and are to be avoided, if possible. Design modifications have to be negotiated with the A/E firm thru the contracting office to arrive at a mutually acceptable fee.

7. Design Submittals. The suggested design submittal process includes the following design phases, however, each project is evaluated for the best submission approach, as well as the acquisition approach (example: design-build, and design bid build).

7.1 30-35 Percent Design. The phase is referred to as the conceptual design or schematic design. The submission demonstrates compliance with the relevant codes and zoning, the space program, identified in the programming phase, functional requirements, adjacencies, and massing respect the context for the project. Engineering systems are defined in a narrative form in this phase. The building envelope is defined also and respects and relates to the context of the project. Ideally, the A/E considers at least three conceptual options before recommending one. A design narrative is included describing the design approach and the rationale for it. The cost estimate is consistent with the programming phase and is included in the report. The A/E submits documentations/calculations showing how energy, water and datacenter performance standards will be met.

7.2 60-65 Percent Design. This phase is referred to as Design Development phase. Engineering system are defined in this phase and incorporated into architecture. This includes civil, structural, HVAC, plumbing, electrical, fire protection, and security. All building elements/components are selected, defined, and incorporated in this phase of the work. This includes, building envelope, interior construction, service spaces, and elevators. Outline specifications are produced and included in this package. The A/E submits updated documentations/calculations showing how energy, water and datacenter performance standards will be met.

7.3 90-95 Percent Design. This is the Construction Document phase. This includes the

production of the working drawings for the project identifying all the necessary details. Engineering disciplines are coordinated and incorporated into architecture. The drawings are consistent with the specifications. The notes on these drawings result in a single interpretation of a specific set of data or facts and, become the basis of a competitive price proposal. The A/E submits updated documentations/calculations showing how energy, water and datacenter performance standards will be met.

7.4 100 Percent Design. This is the refinement and completion of the previous phase, especially in the area of specifications. The A/E submits updated documentations and calculations showing how energy, water and datacenter performance standards will be met.

7.5 Final Design. The A/E submits hard copies of the design package (full size drawings), original signed mylars, and CDs containing all design drawings (in agreed upon AutoCAD format) and specification format defined in the SOW. The A/E submits final documentations/calculations showing how energy, water and datacenter performance standards will be met.

7.6 On-board Review. In certain cases and when the government wants to accelerate a schedule, it might opt to review the 30 percent or the 60 percent submission in the A/E offices on the boards to save time and the cost of reproduction.

9. Architectural/Engineering Design Disciplines. The following is a brief description of the design philosophy for each architectural/engineering discipline that to be adopted by the A/E design firm. Most of the information is extracted the Facilities Standards for the Public Buildings Service (P-100).

9.1 Civil. Civil engineering design balances cut and fill when the facility is placed on a contoured site. Utilities connection points and routing are coordinated with the utility provider companies by the civil engineer. Utility elements are located in a way that will provide easy access and are integrated into the landscape design without creating a negative visual image.

9.2 Landscape Architecture. The quality of the site design will be a direct extension and integration of the building design intent. It represents significant Federal investment and, wherever possible, makes a positive contribution to the surrounding urban, suburban or rural landscape in terms of conservation, community design and improvement efforts, local economic development and planning, and environmentally responsible practices. The use of site design to aid energy conservation and sustainability is encouraged. Solar orientation of the building and well placed plant material can be used to increase heat gain in the winter and reduce heat gain during the summer. Sustainable design benefits GSA with healthier, longer lived plantings which rely less on pesticides, herbicides and fertilizers, minimizes water use, requires less maintenance and increases erosion control.

9.3 Architecture. Landscape, architectural and interior design are integrated with all project design disciplines in order to optimize building performance and aesthetics. Prior to initiating any schematic design, the architect performs a series of coordination meetings with all project design disciplines/consultants to explore performance and functional objectives that could impact building orientation, massing, space adjacencies, material selections, and assemblies.

9.4 Interior Design. General Office Space (open and enclosed offices) comprises a large

proportion of area in Federal (NWS) buildings. Materials, surfaces, and systems are chosen with quality and flexibility as primary concerns. Office spaces characteristically change with their occupants, occupancy configurations and utility requirements. Interior finishes allow these transformations to occur with minimal disturbance and cost.

9.5 Structural. The structural design for a facility should respect the architectural concept and be consistent with it. The structural designer should be aware of the region where the facility is to be located and the available construction technology. The design should consider local environmental issues such as hurricanes in the southern region, extreme cold temperature in the Alaska region, and earthquakes in western and Alaska regions.

EPA Comprehensive Procurement Guidelines list materials containing recycled content for use in construction of buildings funded with federally appropriated funds. An example is the use of fly-ash in concrete mix.

9.6 Mechanical (HVAC). The design of an NWS facility air conditioning system needs to take into consideration energy efficiency, maintainability, and cost effectiveness. The Energy Independence and Security Act (EISA) of 2007) and FAR section 23.704 direct government agencies to purchase products in the upper 25 percent of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR7 product labeling program, and it is the NWS intent to fully comply with this requirement. This will result in substantial operating cost savings, while at the same time minimizing pollution.

LEED guidelines as they apply to mechanical system design will also be included in the design of WFO's. This would entail a mechanical system commissioning, minimum indoor air quality performance (IAQ), carbon dioxide monitoring, increased ventilation effectiveness, and compliance with ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.

Energy efficiency can be improved by taking into consideration local conditions whenever possible. For example, an economizer mode takes advantage of free cooling. Geothermal heat pumps should be used whenever possible to reduce energy costs. Architects should also be consulted so new buildings can be positioned to take advantage of natural shade and operable windows positioned to take advantage of natural breezes. Variable air volume (VAV) systems will be standard so the proper amount of air will be delivered to building occupants and equipment. Where local atmospheric conditions dictate the installation of a humidification system an ETL and C-ETL listed, self contained, factory wired cabinet type; electric evaporative humidifier should be used. Proper humidification levels will increase occupant comfort and prevent Electrostatic Discharge (ESD), which can damage electronic equipment.

Direct digital controls (DDC) will be native BAC net systems compliant with ANSI/ASHRAE Standard 135-2008 to allow for greater flexibility for future system modifications. The controls system will run on Java-based software for added network security and will be accessible through any standard web browser, providing building zone temperatures, equipment control, and system alarms. The controls system will use an algorithm developed by the NWS to control the discharge air temperature, VAV boxes, and duct heaters based on a comparison of building zone temperatures to provide tighter temperature control. The HVAC system will be connected to the facility's emergency power system and air handling units, condensing units. Computer

room air conditioning units will be redundant, so in the event of an equipment failure, a back-up unit comes on automatically. These measures will minimize disruption to mission critical work and provide a comfortable working environment for the building occupants.

Each WFO will also have a redundant stand-alone computer room air conditioning system providing conditioned air to the space through the computer room flooring. The air conditioning units will be sized to maintain a constant 72 to 77 degree temperature and provide an adequate humidity level for the computer room to avoid ESD. Computer room temperature set points less than 72 degrees result in wasted energy, and unless specifically recommended by an equipment manufacturer, are to be avoided at all times.

9.7 Electrical.

9.7.1 Emergency Power Systems.

1. The emergency power system is designed in accordance with NFPA 110, Emergency and Standby Power Systems.
2. Generators are located at least 30 m (100 feet) from communications frame equipment to avoid radio frequency interference.
3. The distribution system is designed so that emergency and auxiliary power sources cannot backfeed energy into the de-energized normal voltage systems under normal, emergency or failure conditions.
4. Automatic transfer switches serving motor loads will have in-phase monitor (transfer when normal and emergency voltages are in phase) to reduce possible motor damage caused by out-of phase transfer.
5. In order to reduce possible nuisance tripping of ground fault relays, automatic transfer switches serving 3 phase, 4-wire loads will have 4-pole contacts with an overlapping neutral.
6. Automatic transfer switches will include a bypass isolation switch that allows manual bypass of the normal or emergency circuits in the event of a switch failure or required maintenance.

9.7.2 UPS.

1. When generator back-up is not available, sufficient battery capacity is necessary to allow for an orderly shut-down.
2. A UPS system should be sized with 25 percent spare capacity and serve critical loads only. The nature, size, and locations of critical loads to be supplied by the UPS will be provided in the program.
3. If the UPS system is backed up by a generator to provide for continuous operation, then the generator provides power to all necessary auxiliary equipment, i.e., the lighting, ventilation, and air conditioning supplying the UPS and serving the critical technical area.
4. The system status panel will have an appropriate audio/visual alarm to alert operator of potential problems and include the following monitoring and alarm functions: system on, system bypassed, system fault, out of phase utility fault, closed generator circuit breaker.
5. Since UPS equipment rooms are usually unattended, an additional remote system

status panel is necessary in the space served by the UPS.

6. Design the battery room in accordance with Article 480 of Nation Electrical Code AStorage Batteries@. Provide emergency lightning in both spaces.
7. Provide a telephone in or adjacent to the UPS room. Battery room design will accommodate: proper ventilation; hydrogen detection, spill containment; working clearances.

9.8 Fire Protection. Essential electronic facilities consist of spaces that have high value or mission essential electrical equipment such as mainframe computers or telephone switches with the potential for high dollar loss and/or business interruption. Essential electronic facilities will be designed in accordance with NFPA 75 and the appropriate local code relative to computer room fire alarm system specification.

9.9 Security. The system requirements are based on the Physical Security Criteria for Federal Facilities, Homeland Security, an ISC Standard. The Regional DOC Security Officer recommends mitigation measures based on the vulnerability assessment recommendations.

9.10 Energy Efficiency. All new projects will be designed to meet or exceed energy performance 30% beyond ASHRAE 90.1-2007. The A/E will model energy consumption to show compliance. The A/E will confirm actual performance consumption using the EPA's Energy Start Portfolio Manager system.

9.11 Potable Water and Irrigation. Designs will specify the use of EPA "Water Sense" labeled fixtures (faucets, showerheads, toilets, and urinals) including dual flush toilets in all projects. Regarding the use of potable water for irrigation, projects are encouraged to implement water reuse strategies into their design. Water reduction strategies for irrigation include xeriscaping plantings and rainwater collection systems.

9.12 Hot Water. Designs will incorporate the hot water mandate set by the Energy Independent Security Act (EISA) of 2007 which requires that 30% of hot water demand in new Federal buildings and major renovations be met with solar hot water, if it is LLC effective. The A/E will conduct the LCC analysis.

9.13 Datacenters/Room. Energy consumption for datacenters or data room within NWS put a significant strain on building operation & maintenance and utility cost budgets. To help reduce these significant long term costs, all projects which include a datacenter/room will strive for an average Power Usage Efficiency (PUE) of 1.5 or better using (PUE = (total data center input power)/ (IT load power)). Significant reductions in energy consumption for data centers/rooms can be obtained by implementing energy efficient systems such as: air flow management, variable speed equipment, energy efficient lighting, limiting electrical distribution losses, use of free cooling, use of premium efficiency motors, commissioning, and heat recovery. Reference the DOE's FEMP Best Practices Guide for Energy-Efficient Data Center, February 2010 for additional guidance. In addition to these requirements, datacenters/rooms require the installation of two advanced sub-meters: one capturing energy used to support the datacenter/room (lighting, HVAC, and computer equipment) and the second to measure the energy usage of just the IT equipment. These two meters will be used to track the datacenter/room's PUE.

10. References. The following references contain greater detail:

    1. NWS Policy Directive 30-41, Facilities Management.
    2. NOA 217-104, Facility Capital Planning and Project Management Policy.
    3. NAO 216- 6, Environmental Review Procedures for Implementing the NEPA.
    4. The Architect's Handbook for Professional Practice.
    5. GSA Facilities Standards for the Facilities Standards for the Public Buildings Service.
    6. DOC Strategic Sustainability Performance Plan.
    7. Energy Independence and Security Act of 2007.
    8. EO 13514, Federal Leadership in Environment, Energy, and Economic Performance.