

## SECTION 133424

### DOME SALT STORAGE STRUCTURE

**THIS IS A PERFORMANCE SPECIFICATION REQUIRING BOTH DESIGN AND CONSTRUCTION OF THE STRUCTURE.**

#### PART 1 GENERAL

##### 1.01 RELATED WORK SPECIFIED ELSEWHERE

**USE SECTION 033001 IF THIS PROJECT IS A SALT STORAGE STRUCTURE ONLY. IF OTHER BUILDINGS ARE PART OF THE CONTRACT, USE SECTION 033000 (CONSULT WITH D&C PROJECT MANAGER).**

- A. Cast-In-Place Concrete: Section 033000 or 033001.

**INSERT APPROPRIATE ROOFING SECTION NUMBER IN PARAGRAPH BELOW. DELETE UNDERLINES BEFORE INSERTING SECTION NUMBER.**

- B. Roofing: Section \_\_\_\_\_.
- C. Motors and Motor Controllers: Section 260221.
- D. Earthwork: Section 310000.

**DELETE PARAGRAPH BELOW IF SECTION 321216 IF NOT USED.**

- E. Asphalt Concrete Paving: Section 321216.

##### 1.02 REFERENCES

- A. Except where more stringent requirements are specified, comply with the applicable requirements of the following organizations and standards, for products, materials, and construction methods:
1. New York State Uniform Fire Prevention and Building Code.
  2. American Institute of Steel Construction (AISC).
  3. American Institute of Timber Construction (AITC).
  4. American Iron and Steel Institute (AISI).
  5. American Plywood Association (APA).
  6. American Softwood Lumber Standard PS 20 by the U.S. Dept. of Commerce.
  7. American Society of Civil Engineers (ASCE 7-98 - Minimum Design Loads for Buildings and Other Structures).

##### 1.03 DESCRIPTION

**EDIT PARAGRAPH BELOW IF NO CONVEYOR IS REQUIRED**

- A. Provide design and construction for a permanent salt resistant dome type structure suitable for the bulk storage of salt with minimum ground water contamination and loaded by means of a fixed stainless conveyor. The structure shall meet or exceed the performance criteria of this specification and the New York State Uniform Fire Prevention and Building Code.

#### 1.04 DEFINITIONS

- A. The term “salt” as used in this Section refers to sodium chloride or calcium chloride snow-melting salt.

**EDIT BELOW IF DIFFERENT.**

- B. The term “floor” as used in this Section refers to the portion of the asphalt concrete paved surface of the structure site exposed within the inner structure perimeter.

#### 1.05 PROJECT REQUIREMENTS

**FILL IN BLANK SPACE BELOW (CONSULT TEAM LEADER). DELETE UNDERLINES BEFORE INSERTING REQUIRED INFORMATION. CHANGE “entrance ways” BELOW TO SINGULAR IF ONLY ONE ENTRANCE OPENING. MAKE THE SAME CHANGE IN OTHER PARAGRAPHS CONTAINING “entrance ways” OR “entrance openings”.**

- A. Size of Salt Storage Structure: A \_\_\_ foot diameter by \_\_\_ foot high permanent, rigid, wind and waterproof, exclusive of entrance ways, dome type structure, suitable for the bulk storage of \_\_\_\_\_ rated tons (or \_\_\_ cubic yards) of salt by means of one of the following optional storage methods:
1. Enclose the specified salt capacity entirely within the structure, with pile sides completely or partially contained by the structure or by separate, structurally sound containing walls. If the pile sides are partially contained, the remaining uncontained pile sides shall be assumed to be sloped at a 32 degree angle of repose above the contained portion.
- B. Foundation: As required to permanently support the structure and meet the requirements of this section.
- C. Interior Space: The salt pile storage floor area shall be entirely free of columns and roof supports of any type allowing unimpeded loading of truck-spreader vehicles with front-end loading equipment.
1. Minimum Interior Clearance: 3 feet of unobstructed vertical clearance above the surface of the salt pile when stored at the specified storage capacity.
- D. Interior Base Wall: Suitable interior protective base wall or protective lining conforming to the following applicable criteria:
1. An interior protective base wall or a protective lining for the primary building wall, separated from, attached to, or integral with, the primary building wall. Extend the base wall a minimum of 10 feet above the building floor.
    - a. Base wall or protective lining shall restrict the salt from contact with the primary building wall components or material subject to salt corrosion unless the primary building wall is specifically resistant to corrosion from salt contact.
    - b. Base, lining or primary building wall shall be of sufficient strength to resist a horizontal impact of 250

pounds per linear foot at 7 feet above the floor, resist the horizontal load of a sand and salt pile weighing 110 pounds per cubic foot and shall resist structural damage from abrasion by salt loading equipment.

c. If the building layout partially restricts the salt pile with the building walls or with separate containing walls, extend the building walls, base walls or lining a minimum of 2 feet above the toe of the remaining salt pile side. The 2 feet extension of the building walls, base walls or lining above the toe shall be of the same material used below the toe level. Plywood and light wood framing will not be acceptable as an extension above the toe.

d. Base wall or protective lining materials shall require minimal maintenance and be arranged for easy replacement of components by maintenance personnel without required use of heavy equipment.

2. Provide a 4 inch wide yellow painted salt storage limit line around the perimeter of interior base wall or protective lining located at 8 feet above the finished floor to indicate the toe of salt pile.

3. Penetrating Sealer for Concrete Walls: Non-toxic, breathable, clear penetrating sealer intended for 2 coat application, leaving no visible surface residue, color or gloss after curing.

Acceptable Products:

- a. Airdox 40 by Anti Hydro International, Inc., Newark, NJ
- b. Klereseal 940-S by Pecora Corporation, Harleysville, PA
- c. Masterseal SL 40 by Master Builders, Inc., Streetsboro, OH
- d. Sil-act ATS 42 by Advanced Chemical Technologies, Oklahoma City, OK

**EDIT PARAGRAPH BELOW IF ONLY ONE ENTRANCE IS REQUIRED.**

E. Entrance Ways: Roof and sidewalls of entrance way shall be integral with the main structure. Roof edge of openings shall have corrosion resistant gutter to divert rain water a minimum one foot beyond each side of opening. Sidewalls shall project out from the structure in a vertical plane originating a minimum of one foot from the point where the salt, stored to capacity, meets the floor surface. Openings shall have protection for interior and exterior sidewall structural members fabricated to resist a horizontal impact of 250 pounds per linear foot at 3 feet above the structure floor or paved surface and to resist abrasion damage to protective components from wheeled vehicles. Openings shall have roller curtain door protection against birds entering the structure.

**INSERT DRAWING NUMBER IN SUBPARAGRAPH BELOW. DELETE UNDERLINES BEFORE INSERTING DRAWING NUMBER.**

1. Number and Size: One unobstructed entrance opening, 30 feet high by 20 feet wide, see the site plan on Drawing \_\_\_ for location of entrance openings.

F. Exterior Wall Construction: Standard components or an integrated wall system, with the exterior surface constructed to provide a durable weather-

resistant base with leakproof joints. Exterior surface shall be constructed of materials which may be easily maintained by maintenance personnel with nonproprietary products readily available for such purpose.

1. If wood is used as an exposed exterior surface, minimum acceptable finish shall be 2 coats of protective wood stain or one prime coat and 2 finish coats of paint, of optimum quality and of a type compatible with the wood species used. Products shall be of a recognized manufacturer of preservative products.
2. If metal is used as an exposed interior or exterior surface, the metal shall have a corrosion-resistant finish. Exposed galvanized metal is not acceptable.

**INSERT APPROPRIATE ROOFING SECTION NUMBER IN PARAGRAPH BELOW.  
DELETE UNDERLINES BEFORE INSERTING SECTION NUMBER.**

G. Roofing System: Prefabricated or site-built, complete with all necessary accessories including the engineered metal cap capable of supporting the conveyor along with fastening devices, trim, and flashings. Materials and surface finishes as required by Specification Section \_\_\_\_\_.

H. Roof Ventilation: Suitable openings located at or near the highest point of the roof providing a ratio of one square inch of free air area for each 55 square feet of structure floor area. Each ventilation opening shall have a permanent, rigid, weatherproof metal ventilator enclosure securely anchored to the structure roof.

I. Dormers: Two required, with sidewalls and roof to match main structure. The vertical outward facing wall of each dormer shall be framed to accept and support a 42 by 42 inch louvered fan.

J. Building Products: The following minimum required standards shall be met for the products listed.

1. Concrete if used in the building design, shall have a minimum compressive strength of 4500 psi at 28 days. If salt stored at the specified capacity will contact exposed concrete, provide a minimum 2 coats of penetrating sealer on exposed interior concrete surfaces.
2. Wood if used in the building design shall be dressed timber, kiln dried to a maximum moisture content of 19 percent before treatment and grade stamped. Wood exposed to weather, shall be preservative treated with a water-borne preservative for above ground use, complying with American Wood Preserver's Bureau AWPB-LP2 (CCA .40). Below ground lumber shall be treated with AWPB-LP-22 (CCA .60).
3. If wood is used as an exposed exterior surface, minimum acceptable finish shall be 2 coats of protective wood stain meeting the requirements of the Building Codes of New York State.
4. Metal, Metal Plates and Fasteners: If used in the building design, shall be designed to resist corrosion due to salt, salt spray or salt vapors.
  - a. All metal exposed on the interior, including truss bearing plates, anchor bolts, bolts and washers,

screws, nails etc. shall be Type 304 or 316 stainless steel or hot dip galvanized meeting ASTM A153-Class D.

b. Joist hangers shall be G-185 hot dipped galvanized and field epoxy coated.

c. If metal is used as an exposed siding or roofing surface, the metal shall have a corrosion-resistant finish. Exposed galvanized metal or an interior surface of metal is not acceptable.

5. Penetrating Sealer for Concrete Walls: Non-toxic, breathable, clear penetrating sealer intended for 2 coat application, leaving no visible surface residue, color or gloss after curing.

Acceptable Products:

a. Airdox 40 by Anti Hydro International, Inc., Newark, NJ.

b. Klereseal 940-S by Pecora Corporation, Harleysville, PA.

c. Masterseal SL 40 by Master Builders, Inc., Streetsboro, OH.

d. Sil-act ATS 42 by Advanced Chemical Technologies, Oklahoma City, OK.

## 1.06 STRUCTURAL REQUIREMENTS

**INSERT VALUE IN PARAGRAPH BELOW FOR SPECIFIC PROJECT REGION. CONSULT STRUCTURAL ENGINEER.**

A. Static Snow Load: Ground Snow Load is \_\_\_psf.

B. Lateral Wind Load: \_\_\_ mph (3 sec wind gust).

**INSERT VALUE IN PARAGRAPH BELOW. CONSULT SOILS ENGINEER.**

C. Foundation Design Data: Refer to the Contract Geotechnical Notes (presented on Drawing \_\_\_) for the parameters required to design the building foundations and the cantilevered retaining walls of the salt storage structure.

## 1.07 SUBMITTALS

A. Pre-Award Submittal: Submit 8 copies of the following information, stamped and signed by a NYS licensed Professional Engineer, as proof of conformity to the performance requirements of this Section.

1. Drawings:

a. Design drawings indicating in detail all features of the proposed structure including, but not limited to, the following:

- 1) Foundation and anchor bolt plans and details.
- 2) Base wall details.
- 3) Entranceway details.
- 4) Roofing and ventilation details.
- 5) Roof and wall bracing details.

6) Anchorage and splice details.

7) Stainless Steel

Conveyor Details

2. Complete set of specifications specifying all materials to be provided in the proposed structure and the installation of all the materials.

3. Complete and extensive set of calculations for the entire structure including but not limited to the following:

a. Certification that the proposed structure meets all requirements of the New York State Uniform Fire Prevention and Building Code including provisions for drifting and unbalanced snow load, according to ASCE 7-98 - Minimum Design Loads for Buildings and other Structures. This is a pre-award submittal; refer to 002217, Supplementary Instructions to Bidders - Condition of Award.

b. Certification that the proposed structure will hold the salt capacity required by the contract documents. This is a pre-award submittal; refer to 002217, Supplementary Instructions to Bidders - Condition of Award.

c. Design loads and load combinations.

d. Foundation design and loads including proposed structures' allowable differential settlement.

e. Finite element analysis of any proposed thin shelled structure, any structure that relies on stressed skinned panels to resist lateral loads or any non-conventionally framed structure.

g. Lateral load resisting system calculations showing path of all loads from the roof to the footings.

h. Unbalanced horizontal load of partial sand and salt pile on base wall.

4. Quality Assurance Qualifications: Names and proof of conformity for preparer, fabricator, and erector including but not limited to the following:

a. Preparer: Names and addresses of 5 previous design projects of preparing construction documents of similar or greater difficulty.

b. Fabricator: Names and addresses of 5 previously fabricated structures and records on past performance.

c. Fabricator's facility and equipment: Name and location of the facility including storage capability, heating controls and quality control equipment.

d. Erector: Names and addresses of 5 previously erected structures.

5. Quality Control Qualifications: Copy of the Quality Control (QC) program including name and experience of fabricator and erector.

B. Quality Control Submittals:

1. Test Reports: Submit 3 copies of each of the following:
  - a. Moisture, temperature and fabrication inspection reports, for all main material.
  - b. Test reports shall be submitted no later than the end of the week covered by the reports.

C. The Director reserves the right to consider submittals for a structure varying in minor respects from specific requirements.

D. The submittal will be reviewed and 3 stamped copies returned. If returned copies are stamped “DISAPPROVED” or “RETURNED FOR CORRECTION”, promptly resubmit 8 copies of documentation meeting Contract requirements.

**INCLUDE DOCUMENT 002217, SUPPLEMENTARY INSTRUCTIONS TO BIDDERS - CONDITION OF AWARD, IN THE PROJECT MANUAL FOR ARTICLE BELOW.**

#### **1.08 QUALITY ASSURANCE**

A. Preparer’s Qualifications: The person who prepares the Work of this Section shall have a minimum of 5 years experience in preparing construction drawings that are similar to the requirements of this Section and shall have prepared drawings for at least 5 structures of equivalent or greater difficulty as required by this Section.

#### **1.09 INSPECTION**

A. Quality Control Inspection: Maintain Quality Control (QC) inspection during the fabrication and erection of the building.

1. Submit for approval a copy of the QC Programs of the proposed fabricator and erector, including a list of their QC personnel and respective duties. QC program shall include construction tolerances and methods of constructing to the tolerances.

B. Quality Assurance (QA) inspection of building component fabrication may be made at the discretion of the Director’s Representatives. The Director’s Representative shall be given free and easy access to fabrication shop and field at all times that work is in progress. QA inspections will be made without cost to the contractor.

**INCLUDE 007306 SUPPLEMENTARY CONDITIONS - WARRANTY EXTENSION. MODIFY THE STANDARD 007306 DOCUMENT AS NECESSARY FOR BELOW AND ANY OTHER ROOFS IN THE PROJECT.**

#### **1.10 WARRANTY**

A. Special Warranty: The one year period required by Paragraph 9.8 of the General Conditions is extended to 2 years for the roofing system of the salt storage structure. Refer to Supplementary Conditions.

B. Manufacturer’s Warranty: In addition to the 2 year period specified in the Supplementary Conditions, furnish the roofing manufacturer’s 15 year material warranty for the roofing of the salt storage structure.

1. Material warranty shall include warranty against leakage due to material defects, including corrosion and rust.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE DOME MANUFACTURERS**

- A. Dome Corporation Inc., 28101 South Yates Ave., Bleecheer, Ill. 60401-3603 (708) 946-9595.

### **2.02 DOME MATERIALS**

- A. Materials provided shall have a minimum life expectancy of 25 years and shall have been used for its intended purpose for a minimum of 10 years.
- B. As required by the approved construction drawings and specifications and complying with the requirements of this Section and applicable references.

**EDIT BELOW IF NO DOOR IS REQUIRED OR IF A DIFFERENT DOOR IS USED.  
COORDINATE ELECTRICAL REQUIREMENTS WITH ELECTRIC**

### **2.03 ACCEPTABLE ROLLER CURTAIN DOOR MANUFACTURERS**

- A. BLOCK N ROLL, P.O. Box 204, Glen Ridge, N.J. 07028, (866) 256-2567, www.blocknroll.com.

### **2.04 ROLLER CURTAIN DOOR MATERIALS**

- A. Roller Curtain Door: Complete door frame assemblies with door netting, motor, tracks, and appurtenances, sized and arranged to suit opening sizes, conditions and clearance limitations indicated on the Drawings.
  1. Roller Tube/Axle: Extruded aluminum/mill finish, outside diameter 3-3/16 inch, wall thickness .119 inch.
  2. Hood: 3/16" extruded aluminum with same thickness end plates bolted into the main hood body.
  3. Motor: "Superwinch" Single output 12 Volt DC power drive unit.; 60:1 gear ratio; Torque 1040 in./lb; 1.1HP; 25-30 amps.
    - a. Accessories
      - 1) 40 amp circuit breaker mounted on quick disconnect cables.
      - 2) Two key-type remote control units.
      - 3) Manual operating box.
      - 4) Trickle Charger: 1.5 amp; fully automatic designed to turn on/off as needed; capable to provide full charge in 2 to 12 hours.
    4. Fabric (Main Body): Open weave vinyl coated polyester; 14 oz. per sq. yd., high tensile/tear strength, moisture resistant/quick drying, withstands temperatures below 0 degrees F, shade factor; 65percent. All seams are heat-welded.



- a. Axle attachment: 1/4 inch silicone rope sewn in to slide into groove in axle tube.
- b. Bottom: 2 inch pocket sewn to accept weight bar.
5. Fabric (Edge Trim): Doubled with 2 inch webbing.
6. Weight Bar: One inch diameter galvanized steel tube.
7. Weight Bars (Connecting Hardware): End piece/steel jaw slide.
8. Webbing/Ratchets: Two- 2 inch wide black polypropylene webbing with eyehooks; (appropriate lengths are provided to keep door from billowing in high wind areas) ratchets-self-locking manual operation to keep webbing taut.

**DELETE BELOW IF NO CONVEYOR IS REQUIRED**

**2.04 STAINLESS STEEL CONVEYOR**

- A. Conveyor: The following minimum required standards shall be met for the product listed.
  1. Fixed Conveyor: 24 inches wide by approximately 92'-6" long; Type 304 stainless steel belt salt conveyor with support framing and foundations; integral with and connected to the Salt Storage Structure.
    - a. Capacity: Able to move 70pcf Salt at 300 tons per hour up an angle of 32 degrees.
  2. Construction:
    - a. Sides: Type 304 stainless steel, 10 Gage.
    - b. Bracing: 2 inches by 2 inches by 1/4 inch Type 304 stainless steel.
    - c. Truss: 2 inches by 2 inches by 1/4 inch Type 304 stainless steel.
    - d. Webbing: 1-1/2 inches by 1-1/2 inches by 3/16 inch stainless steel.
    - e. Slide Pads: UHMW 5/8 inch thick.
    - f. Return Idlers: Ralph Pugh PVC.
  3. Rollers:
    - a. Drive Roller: 10 inches by 25 inches Crown Face with Lagging.
    - b. Take-up Roller: 8 inches by 25 inches Crown Face.
    - c. Tail Rollers: 8 inches by 25 inches Crown Face.
  4. Belting: 24 inches wide 200# PVC Crescent Top with stainless steel splice.
  5. Drive: 40 HP, 60 Hz, 200 V, Three Phase, Severe Duty High Efficiency Electric Motor.
    - a. Totally Enclosed and Fan Cooled: TEFC (IP55) water tight and dust tight enclosure suitable for wet and dirty environments.
    - b. Corrosion-resistant construction.
    - c. Epoxy finish.

- d. Stainless steel shaft.
  - e. Plastic or bronze integral motor cooling fan.
  - f. Stainless steel nameplate.
  - g. Corrosion-resistant hardware.
  - h. V-belts and pulleys with stainless steel belt guard.
6. Undercarriage: 4 inches by 8 inches mild tube steel, painted with corrosion resistant paint.
7. Features:
- a. Grease hoses for greasing top end bearings.
  - b. Dust Cover: 18gage, Type 304 stainless steel.
  - c. Deflector: Type 304 stainless steel.

**DELETE ARTICLE BELOW IF NO CONVEYOR IS REQUIRED.**

**2.05 STAINLESS STEEL TRUCK UNLOADING CONVEYOR**

A. Truck Unloading Conveyor: The following minimum required standards shall be met for the product listed.

Portable Conveyor: 24 inches wide by 10'-0" flat by 7'-0" incline, Type 304 stainless steel, PVC Belt, truck unloading salt conveyor.

1. Construction:
- a. Sides: Type 304 stainless steel, 7 gage, 10 inch channel frame with cross bracing.
  - b. Bracing: 2 inches by 6 inches by 3/16 inch Type 304 stainless steel tubular incline frame with tubular cross bracing.
  - c. Dump Hopper: Type 304 stainless steel, 10 gage, 10'-0" long by 3'-0" by 22 inch dump hopper with adjustable weigh breaker.
2. Pulleys:
- a. 10 inch crowned vulcanized pulley with 2-3/16 inch shaft.
  - b. 2 inch snub pulley with 1-7/16 inch shaft.
  - c. 6 inch channel wing take up pulley with 1-7/16 inch shaft.
  - d. 6 inch bend drum pulley with 1-7/16 inch shaft.
3. Bearings: 920 Series Pillow Blocks.
4. Belting: 24 inch wide 200# PVC Crescent Top with stainless steel fasteners.

**COORDINATE BELOW WITH ELECTRICAL DESIGNER.**

5. Drive: 15 HP, 60 Hz, 200 V, Three phase, Severe Duty High Efficiency Electric Motor with:
- a. Totally Enclosed and Fan Cooled: TEFC (IP55) water tight and dust tight enclosure suitable for wet and dirty environments.
  - b. Corrosion-resistant construction.

- c. Epoxy finish.
  - d. Stainless steel shaft.
  - e. Plastic or bronze integral motor cooling fan.
  - f. Stainless steel nameplate.
  - g. Corrosion-resistant hardware.
  - h. V-Belts & Pulleys with Stainless Steel Belt Guard.
6. Transport:
- a. 6000 pound axle with tires and wheels.
  - b. Pintle hitch on tail end of conveyor.
  - c. Tongue jack.

**DELETE ARTICLE BELOW IF NO CONVEYOR IS REQUIRED**

**2.06 CONVEYOR MOTOR CONTROL CENTER**

- A. The following minimum required standards shall be met for the product listed:
- 1. NEMA 4X Enclosure suitable for corrosive salt environment and with accessories for maintaining the internal temperature of the enclosure within solid state starter temperature ratings with the outside temperature down to minus 30 degrees F.
  - 2. Solid state soft starter for 40 HP stainless steel conveyor motor.
  - 3. Solid state soft starter for and special power outlet for the 15 HP truck unloading conveyor motor.
  - 4. Pre-wired main disconnect and fuses.
  - 5. Start-Stop control.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Examine the site area and conditions upon which the storage structure will be constructed. Notify the Director in writing of conditions that will adversely affect the execution and quality of the Work of this Section. Do not proceed until unsatisfactory conditions are corrected.

**3.02 INSTALLATION AND ERECTION**

- A. Install required wall foundations and substructures or supports at the required elevations on properly prepared sub-grade, as required for the erection of the complete storage structure.
- B. Erect the Dome salt storage structure and required appurtenances on prepared foundations, conforming to the requirements of this Section, complete and ready for the storage of salt.

**EDIT BELOW IF NO DOOR IS REQUIRED OR A DIFFERENT DOOR IS USED**

C. Install roller curtain doors and accessories in accordance with the manufacturer's printed instructions, except as otherwise specified or shown.

**DELETE BELOW IF NO CONVEYOR IS REQUIRED**

D. Install conveyor and accessories in accordance with the manufacturer's printed instructions, except as otherwise specified or shown.

**END OF SECTION**