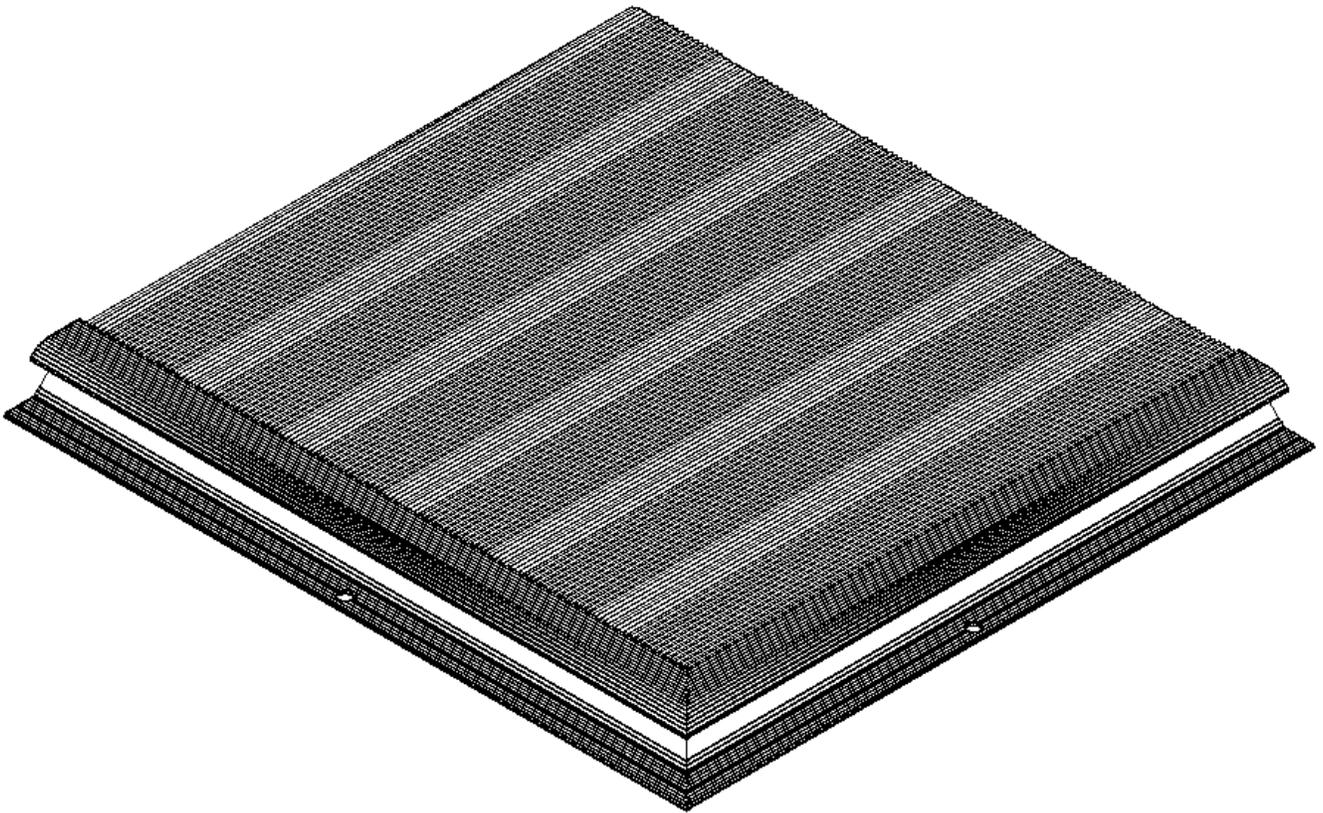




HALLSTEN
CORPORATION
INDUSTRIAL • MARINE • ENVIRONMENTAL

City of Wenatchee Water Resource Division
Operation and Maintenance Manual
For Hallsten Aluminum Covers Job# 11349
Specification # 01340-01-Z.PDF 1/11/2012



Mailing Address: P.O. Box 41036, Sacramento, CA 95841
Plant Address: 6944 34TH Street, North Highlands, CA 95660
Telephone (916) 331-7211 / Fax (916) 331-7223



City of Wenatchee Water Resource Division
Operation and Maintenance Manual
For Hallsten Aluminum Covers Job# 11349
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Cover Supplier

Hallsten Corporation
6944 34th Street
North Highlands, CA 95660
Contact: Gary Powell
Telephone: (916) 331-7211
Facsimile: (916) 331-7223

Sales Representative

Goble Sampson & Associates
Contact: John Simon
Telephone: (425) 392-0491 ext 11
Cell: (425) 736-4584
dallie@goblesampson.com

Contractor

Apollo, Inc.
1133 W Columbia Drive
Kennewick, WA 99336
Contact: Mike Hodgson
Telephone: (509) 586-1104
Facsimile: (509) 583-3686

Engineer

HDR Engineering
2805 St. Andrews Loop
Pasco, WA 99301
Contact: Bruce Dudzik
Telephone: (509) 546-2040

Table of Contents:

<u>ITEM</u>	<u>TAB</u>
O&M Procedures, Equipment Records & Trouble Shooting Guide.....	1
Warranty	2
Quality Assurance	3
Personnel Qualifications	4
Descriptive Brochure	5
Product Data.....	6
Maintenance During Storage Procedures.....	7
Safety Precautions.....	8
Installation Instructions.....	9
Recommended Spare Parts List	10
Material Safety Data Sheets.....	11
Drawings	12



OPERATING & MAINTENANCE INSTRUCTIONS

OPERATING PROCEDURES

Removal:

- a. Remove the anchors and flashing.
- b. Disengage integral sliding latches from beams.
- c. Lift up and remove the individual panels (two personnel required).
- d. Structural beams can remain in place or be removed with the use of mechanical lifting equipment.

Re-Installation:

- a) Inspect all odor control seals and isolation gaskets.
- b) Replace damaged seals and gaskets (if required).
- c) Place structural beams over basin with the use of mechanical equipment
- d) Place each panel run between the interlocking beams.
- e) Engage sliding integral latches under beams.
- f) Install flashing and tighten anchor bolts.

MAINTENANCE SCHEDULE

General:

Routine maintenance is not anticipated, although it is recommended to visually inspect all aspects of the odor control system periodically. Preparing a written report on the items inspected, including a brief description of the findings.

Lubrication or special tools are not required for the routine operation and maintenance of the aluminum odor control covers.

If further action is required, consult Hallsten Corporation's Engineering Department at (800) 473-7440.

Replacement Parts:

The latest revision of the project drawings shall be kept on file for reference both at the manufacturing plant and with the owner. This document will satisfy the immediate reference of custom replacement parts.

For additional information such as cost and delivery time, call Hallsten Corporation's Customer Service Department at (800) 473-7440.



Equipment Data and Spare Parts Summary

Project Name City of Wenatchee WWTP Improvements		Specification Section:
Equipment Name Hallsten Corporation Aluminum Covers		Year Installed:
Project Equipment Tag No(s) Project/Hallsten Job # 11349		
Equipment Manufacturer Hallsten Corporation		Project/Order No. # 11349
Address 6944 34st North Highlands, CA 95660		Phone 800-473-7440
Fax 916-331-7223	Web Site www.hallsten.com	E-mail gpowell@hallsten.com
Local Vendor/Service Center Same as above		
Address		Phone
Fax	Web Site	E-mail

MECHANICAL NAMEPLATE DATA

Equip. Hallsten Aluminum Covers		Serial No. Job # 11349	
Make Aluminum Cover		Model No. Job # 11349	
ID No. Job # 11349	Frame No.	HP	RPM n/A
Size	TDH n/A	Imp. Sz. n/A	CFM n/A
Other:		Cap.	PSI n/A

ELECTRICAL NAMEPLATE DATA

Equip. n/A		Serial No. n/A	
Make n/A		Model No. n/A	
ID No.	Frame No. n/A	HP n/A	V. n/A
Duty n/A	Code n/A	Ins. Cl. n/A	Type n/A
Other: n/A		Amp. n/A	HZ n/A
		PH n/A	RPM n/A
		Temp. Rise n/A	Rating n/A
		SF n/A	

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity
	3/8" Epoxy-tie adhesive anchors	20
	3/8" wedge anchors	20
	Santoprene flat seal with Chevrons	40ft
	Panel splice seal	40ft
	Epoxy anchor - high strength	1 tube
	Sicaflex 1-a	2 tubes

(Jun 1990; Revised Oct 2001, Revised Nov 2007)
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City of Wenatchee Water Resource Division
Trouble Shooting Guide
Hallsten Corporation
Aluminum Covers

1. If a panel looks as though it is damaged: Identify cause of damage and contact Hallsten Corporation to order a replacement panel.
2. Make sure that all hatches close completely. To ensure proper closure of your panel, check to see that all hinges and hatches are free from debris (i.e. dirt, dust, rocks and all other small objects).
3. If the hatches are not closing properly, inspect the hatches for the above mentioned debris and remove it by hand. If the blockage cannot be removed by hand, compressed air may be used. A can of air duster or an air compressor should suffice. **EXAMPLE:**



All hatches should be flush with the surface of the cover, when closed properly. For lasting quality of the hatches and covers, periodic inspection will help to ensure the proper function of your product.



Lubrication Summary

Equipment Description	Project Equip. Tag No(s).
-----------------------	---------------------------

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point							
Lubricant Type	Manufact				SAE #	ISO	
	1						
	2						
	3						
	4						
	5						

**THIS PROCESS IS NOT
NEEDED FOR
HALLSTEN
ALUMINUM COVERS**

Lubricant Point							
Lubricant Type	Manufact				SAE #	ISO	
	1						
	2						
	3						
	4						
	5						

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

(Feb 1991; Revised Oct 2001, Revised Nov 2007)
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WARRANTY/GUARANTEE FOR TANK COVER: ALUMINUM

**City of Wenatchee WWTP Improvements
Wenatchee, Washington
Hallsten Corporation Project No. 11349**

We, the undersigned, do hereby warranty and guarantee that the parts of the Work described below which we have furnished for the above titled project:

Tank Cover: Aluminum, Specification Section 13221

are designed in accordance with the Contract Documents and that all said Work will fulfill or exceed all of the Warranty and Guarantee requirements. More specifically, Hallsten warrants the structures for a period of 5 years from the date of substantial completion as defined in the General Conditions. We agree to repair or replace Work performed by us that proves to be defective in workmanship, material, or operation within the period specified above. Wear and tear and unusual neglect or abuse is specifically excepted.

In the event that the Work is believed to be defective, please contact Hallsten Corporation, in writing, at the address below. Said contact should include the date of the believed defect and a description thereof.

Hallsten Corporation
P.O. Box 41036
Sacramento, California 95841
Telephone (916) 331-7211
Facsimile (916) 331-7223
www.hallsten.com

By: Jeffrey A. Hallsten
Title: President



QUALITY ASSURANCE PROGRAM

Hallsten Corporation uses a multilevel quality control system. This system works as follows:

1. Project Procedure Schedule
2. Training & Certification
3. Inspection & Documentation

Project Procedure Schedule:

This procedure is mandatory on every project produced by Hallsten Corporation. This method allows us to track a project from the order date through design and submittal phases as well as fabrication, delivery and payment. In this way we are able to track and:

- Obtain and/or produce the required documents to process the order
- Design
- Determine if the project is on schedule
- Identify problems (if any) and make appropriate changes
- Coordinate necessary paperwork.
- Schedule deliveries

Training & Certification:

Hallsten Corporation provides employee training in compliance with American Welding Society and Aluminum Association trade standards. Much of this training is focused specifically on custom methods and machinery used by Hallsten Corporation. All company training has a specific goal, to achieve the highest possible quality of product in today's market.

Hallsten Corporation conducts regular training seminars with our vendors. These seminars focus on a variety of subjects such as:

- Product Application and Specific Uses
- Long Term Exposures
- Material Warranties
- Product Maintenance (If Required)
- Replacement Part Program

By doing this Hallsten is able to keep employees and vendors' knowledge current regarding fabrication, application and maintenance.



Inspection & Documentation:

This phase of quality control works very closely with the Project Procedure Schedule. That is due to the fact that all phases of work done on a project are initially done by the assigned employee and reviewed by his/her immediate supervisor. This is true for all phases of work done.

Including:

- **Material and Labor Estimating**
- **Initial Design Concepts**
- **Drafting and Detailing**
- **Fabrication and Packaging**
- **Quality Control Reports**



Hallsten Corporation Management Qualifications

John Hallsten – Chairman

John founded Hallsten Corporation in 1966. He is actively engaged in the engineering and planning of all business aspects each day. The wisdom he brings to the company with over 40 years of experience is outstanding.

Jeffrey A. Hallsten, P.E. – President

Jeff has been a licensed Civil Engineer in the state of California since 1982 (License No. C-34753). For more than 20 years, Jeff has also obtained PE licenses in the states of Virginia (License No. 048249), New Mexico (License No. 20257), and Arizona (License No. 52173). Jeff has specialized in the design of aluminum products such as Odor Control Cover Systems, Marine products, Industrial applications and Pedestrian Bridges. He has over 35 years of experience in the marine construction industry and is in charge of all aspects of engineering.

Roland C. Wright – Vice President, Director of Plant Operations

Roland started working at Hallsten Corporation as a fabricator in 1982. He has over 25 years experience in specialized design of aluminum products. As a foreman, he implemented many quality control procedures that are still used today. Currently, as Vice President, he oversees that all facets of production runs smoothly and efficiently.

Ronald Kuehne, P.E. – Engineering Manager

Ron began working at Hallsten Corporation as an intern in March of 2001. He graduated from Sacramento State University with honors and earned a Bachelor of Science in Civil Engineering. Ron is a licensed Professional Engineer in the states of California (License No. C-74024), Washington (License No. 46584), and Florida (License No. 71980). He has 10 years of AutoCAD experience. Ron Currently oversees both the drafting and engineering departments and prepares structural calculations for all product lines.

Gary R. Powell – Senior Project Manager

Gary started working at Hallsten Corporation in August of 2000. He began as a drafting technician and was quickly promoted to Senior Project Manager. He is involved with the estimating and bidding of all environmental projects. His knowledge of machining and manufacturing along with mechanical background provides as a resource and mentor for the drafters and project managers at Hallsten.

Mark Ray – Production Manager

Mark has been with Hallsten Corporation since June of 1992. Starting as a shop fabricator, Mark moved his way to a field supervisor, and has been Production Manager for the past 7 years. He is a certified steel and aluminum welder and is OSHA certified.

Tom Noble – Controller

Tom was hired as a Corporate Controller in March of 2006. Tom brings more than 28 years of accounting experience to Hallsten Corporation. He has spent the last 10 years as the Corporate Controller of a multi-million dollar business.

Lite-Span[®] Aluminum Covers

4' X 4' AL HINGED ACCESS HATCHES (6 EA.)

AL COVER SPAR ASSEMBLY



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Lite-Span®

“...the most innovative and cost effective aluminum cover on the market, period!”

Hallsten Corporation's Aluminum Lite-Span Covers provide gaseous emissions containment for clarifiers, sludge holding tanks, bio-towers, aeration basins and any number of other storage vessels found in projects of environmental importance.

Innovative and cost effective, the Hallsten Corporation Aluminum Lite-Span Cover represents a breakthrough in modular design and structural efficiency. Hallsten Corporation pioneered the use of extruded aluminum for cover construction. Although imitated, the patented design of the Hallsten Corporation Aluminum Lite-Span Cover has never been equaled. Simply put, there is no “or equal”. The Hallsten Corporation Aluminum Lite-Span Cover is the most innovative and cost effective cover on the market, period!



A TRADITION OF INNOVATION

The Hallsten Corporation Aluminum Lite-Span Cover is the result of a focused effort to design an aluminum cover specifically intended for environmental applications. The design effort has resulted in over a dozen United States Patents. These patents not only cover the primary structural design of the Hallsten Corporation Aluminum Lite-Span Cover but also many of the unique features found only on this cover system. Included in these features are the Gear Hinged Access Hatch Panel and the Double Seal Gutter. The patented Gear Hinged Access Hatch Panel allows any individual panel on a cover system to become a fully opening access hatch. This effectively allows for a cover system that provides total access to the tank below. The Double Seal Gutter provides a patented continuous double seal for irregular or damaged concrete often found in basin retrofit installations. Both of these features are only found on Hallsten Corporation Aluminum Lite-Span Covers. The modular structural design allows Hallsten Corporation to construct covers of any size required on projects of this type.

- Air Tight
- Visually Appealing
- Structurally Superior
- Chemical Resistant
- Energy Saving
- Maintenance Friendly
- Easy To Install

Aluminum Covers

AIR TIGHT

Once installed, the patented double interlocking deck component combined with interlocking beams form a substantially air tight structure. Our unique fabrication techniques and the close design tolerances assure that gases and odors are safely contained. Polymer seals are used between adjoining panels and at the cover perimeter. These replaceable seals allow the thermal expansion and contraction of the cover without compromising the integrity of the joints. Our unique hatch and penetration details provide minimal leakage through these normally troublesome components.



VISUALLY APPEALING

The low profile of the Hallsten Corporation Aluminum Lite-Span Cover provides for a very clean aesthetic appearance. Each component of the system has been designed with an eye towards this aesthetic. A camber is designed into every cover to assure proper drainage of rainwater. This camber can be increased or decreased to vary the aesthetic appearance. The standard mill finish of the aluminum surface components includes a ribbed texture that disguises the unwanted metal appearance common with bent sheet metal covers. Optionally, the cover can be sandblast finished or anodized.



STRUCTURALLY SUPERIOR

The patented design of the Hallsten Corporation Aluminum Lite-Span Cover is structurally superior to any competing cover. Each modular panel can be individually constructed to provide for high load pedestrian paths and working areas. Only Hallsten Corporation can provide a cover with sufficient strength to withstand concentrated loads in excess of 1000 pounds without permanent deformation. Surface dishing from concentrated load over-stressing, so common with bent metal or inferior component based covers, is eliminated with the Hallsten Corporation Aluminum Lite-Span Cover system. The panel and beam configuration allows Hallsten Corporation to design cover structures with extremely high distributed load capacity. The modular configuration provides for unlimited geometric options. Covers can be configured in any shape or size; circular, rectangular or irregular.



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CHEMICAL RESISTANT

The Hallsten Corporation Aluminum Lite-Span Cover is fabricated entirely of 6061-T6 alloy corrosion resistant aluminum extrusions. Every seal used between adjoining panels is of a corrosion resistant polymer. Even the patented connector between the beam and the panel is a structural polymer that is chemical resistant and will not weaken or corrode. A mechanical and replaceable Santoprene seal isolates the cover perimeter from the concrete or steel tank wall. No foam tape or caulk is used.



ENERGY SAVING

A flat cover, when used with odor control units such as scrubbers and other air handling equipment significantly reduces energy costs. By reducing the volume of the enclosed gases, the size of blowers, fans, ducts and scrubbers can be reduced with a proportional savings in power consumption. This creates an overall savings, both in initial construction cost and operation. If required, the Hallsten Corporation Aluminum Lite-Span Cover can be provided with insulation to minimize heat losses in thermally sensitive processes.



MAINTENANCE FRIENDLY

The modular design of the Hallsten Corporation Aluminum Lite-Span Cover makes maintenance substantially easier than our competitors bent metal or inferior component based covers. The Hallsten Corporation Aluminum Lite-Span Cover's modular sections can be easily removed because there are no corroded sheet metal screws, frozen nuts or wedged seals to hinder access. Each panel can be lifted by hand with only the force of its weight unlike some of our competitors units that require special lifting equipment to pry each panel loose. Each Hallsten Corporation Aluminum Lite-Span Cover is as easy to remove as it is to install assuring total access to process equipment. An optional temporary handrail system is available to protect maintenance workers.

The Hallsten Corporation Aluminum Lite-Span Cover includes an integral non-skid surface. Every panel and beam, regardless of position or load capacity, incorporates this surface. Slip resistance is critical to the safety of all personnel.



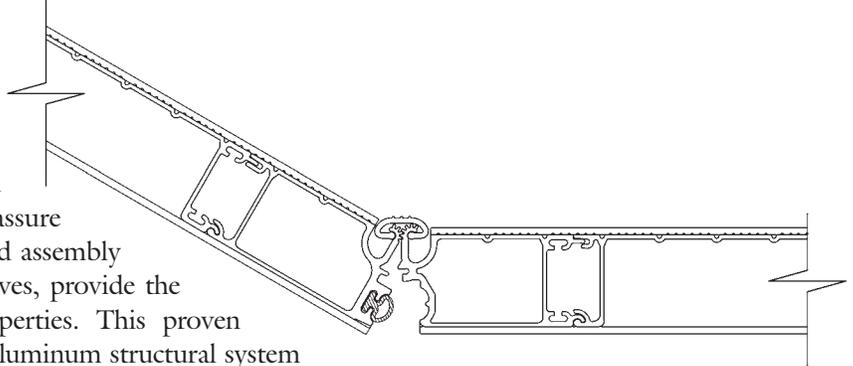
EASY TO INSTALL

The installation of bent metal and inferior component based covers is labor intensive and demands intricate field assembly. By combining fewer parts with modular panel design, Hallsten Corporation is able to reduce installation costs significantly over competitor's designs. This results in a tremendous savings, not only during initial installation, but also in long-term maintenance. A cover that is initially easy to install is also easy to remove and reinstall by plant maintenance personnel should the need ever arise.

SPEC — BID — BUILD, COMPETITION MAKES US COST EFFECTIVE

The combination of superior structural design, unique features and easy installation makes the Hallsten Corporation Aluminum Lite-Span Cover the most cost effective cover system available. Structural efficiency, born as a result of the rigorous competition found in municipal projects, results in a design that maximizes performance while considering the bottom line cost to construct.

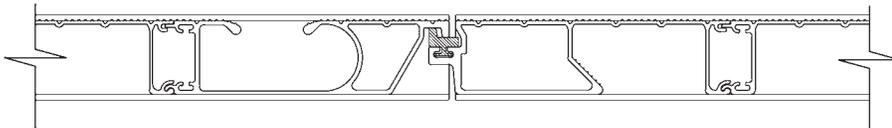
Efficient and cost effective, the Hallsten Corporation Aluminum Lite-Span Cover is truly an innovation in structural technology. This unique system, the result of years of development, has been awarded numerous United States Patents. Each component has been carefully designed to assure maximum performance. Unique manufacturing and assembly techniques, including the use of specialized adhesives, provide the optimal use of aluminum's special physical properties. This proven technology is a direct descendent of the weld less aluminum structural system developed and patented by Hallsten Corporation for use in the rugged marine environment. With proven performance since 1966, the quality of Hallsten Corporation engineering has passed the test of time.



EFFICIENT

The Hallsten Corporation Aluminum Lite-Span Cover utilizes the efficiencies and simplicity of modular design. Although each cover is individually engineered, each shares a family of common components. This allows Hallsten Corporation to manufacture the

cover system in a factory environment employing assembly line techniques and batch processing. The primary structural components, the beams, are sized and

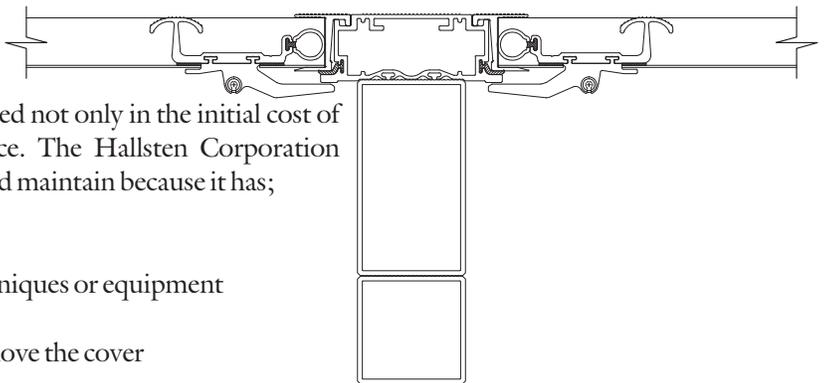


designed using computer analysis to optimize structural efficiency for each cover. The stacked beam assembly technique provides the ability to individually optimize each beam on every unique cover structure. Along with the patented Gear Hinged Access Hatch Panel, deck penetrations and other cover accessories are designed and constructed as an integral part of the cover structure. Deck penetration kits can be field installed to assure that there are no mistakes in the coordination of the trades. Course of construction changes can be easily accommodated with this combination of modular factory construction and field installable accessories and penetrations. The Hallsten Corporation Aluminum Lite-Span Cover system has been designed and is manufactured with real world construction in mind.

COST EFFECTIVE

Efficient design results in cost savings. Savings are realized not only in the initial cost of the cover but also in the installation and maintenance. The Hallsten Corporation Aluminum Lite-Span Cover is less expensive to install and maintain because it has;

- No expensive threaded structural fasteners or rivets
- No special labor-intensive installation or removal techniques or equipment
- No independent support system to install or assemble
- No specially trained personnel needed to install or remove the cover



Bottom line, the Hallsten Corporation Aluminum Lite-Span® Cover is less expensive to purchase, install and maintain.



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HALLSTEN CORPORATION

A Technical Overview

Hallsten Corporation has developed a full line of structural aluminum products. These products are based on a structural system that has evolved through our experience in the design and fabrication of metal structures since 1966. These various products are used in marine, industrial and environmental applications. The basis for the structural system is a unique set of interlocking aluminum components. The use of these components provides a structural system that is very versatile, can be used in a variety of structures and provides unmatched strength and durability.

In the early 1970's Hallsten Corporation pioneered the use of aluminum components for the construction of structures to be used in a marine environment. The extreme corrosion resistance of aluminum in combination with the inherent strength of aluminum extrusions provided the basis for a marine structural system that provided unmatched quality and value. These early structures were fully assembled with welded connections. Hallsten Corporation continued to refine the design of these structures and by the 1980's had eliminated the majority of the welds required to assemble the components. The welded connections were replaced with details that included specialized adhesives as well as nonthreaded mechanical connectors. Where welds were retained, the welds were designed to minimize the effect of fatigue induced in the heat effected areas. These welds were located in areas with minimal cyclical loading. Additionally, the remaining welded connections were designed with longer individual welds, which tend to be more fatigue resistant. The weldless design proved to be highly fatigue resistant as well as much more structurally efficient than a fully welded design due to the elimination of these heat effected areas and their corresponding allowable stress reductions.

The weldless structural design resulted in the issuance of United States Patent number 5,050,361, "Deck Structure". This structural system is comprised of panels that include the primary structural beam section as a frame member for the decking system. When assembled, the structure becomes self-framing as well as self-supporting.

The application of this structural system as a tank cover became evident to the engineers at Hallsten Corporation. A specific design was developed and subsequently United States Patent number 5,325,646, "Tank Cover Structure", was awarded. Our design provides for a cover system with integral support beams as well as a panel system that allows for spanning capacity to meet the needs of any field application. This structural system has been used to construct tank covers of all sizes and in all

geometric configurations; square, round and irregular. This original patent has been supplemented with over a dozen additional patents that have added features and accessories to the original tank cover structural system.

Hallsten Corporation, in partnership with EnviroQuip of Austin, Texas, has developed and been awarded a United States Patent for a cover system with integral air distribution for the aeration of wastewater. This AirBeam cover integrates the innovative TransMax aeration system of EnviroQuip into the Aluminum Lite-Span Cover. The beams of the cover structure become the air distribution plenums for the aeration system. Additionally, the air-metering orifice of the EnviroQuip aeration system is located above the cover surface. This location makes the diffusers truly non-clogging and extremely accessible. Aeration system maintenance can be performed from the slip resistant deck of the cover surface.

Hallsten Corporation has developed and patented a modular biofiltration support system for the construction of large Biofilters used in the elimination of odors for waste treatment processes. The Bio Floor® modules can be quickly assembled to form a biofilter cell of any width and length. The system assures the even distribution of air emitted through the floor with minimal head losses. The floor system supports heavy wheel loads for the use of equipment to service the media beds. Hallsten Corporation has also developed and patented a Modular Containment System For Hazardous Materials. Like the Biofilter the Containment System, primarily used for the secondary containment of potentially hazardous materials, is comprised of polyethylene components. These interconnectable berm members can be configured to form virtually any desired containment perimeter.

Hallsten Corporation has established a reputation for our unique ability to create products that employ modular structural systems. These products allow Hallsten Corporation to engineer specific structures utilizing a family of predesigned components. The result is high performance, efficient structures at very competitive prices. Hallsten Corporation continues to provide design-build structures to a variety of industries. In addition to covers for wastewater and water treatment plants, Hallsten Corporation provides aluminum and steel structures for marine and industrial applications. Typical of these are marine access gangways, floating docks and structures, industrial mezzanines, stairways and man ways, conveyor crossovers and bridging structures as well as steel truss bridges for pedestrian and light vehicular use.

THE HALLSTEN ADVANTAGE

THE MOST EFFICIENT AND COST EFFECTIVE ALUMINUM COVER ON THE MARKET!



Hallsten Aluminum Lite-Span® Covers Replace:

- Concrete
- Fiberglass
- Checkerplate
- Bent Sheet Metal



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SPECIFICATION FOR ALUMINUM ACCESS COVERS

I. GENERAL

1. SPECIFICATION: This specification is for a fully engineered, substantially airtight, aluminum cover structure comprised of panels, and beams as manufactured by Hallsten Corporation, P.O. Box 41036, Sacramento, California 95841, (800) 473-7440. This specification shall be regarded as a minimum standard for design and fabrication.

2. SCOPE OF WORK: Furnish all labor, materials, and equipment to provide a complete, installed system of fixed and removable, custom fit, flat aluminum covers. The Tank Cover system includes cover panels, structural supports, and attaching hardware.



II. ENGINEERING

A submittal shall be provided to the engineer prior to the beginning of fabrication. The submittal shall include:

(a) Complete structural calculations showing the governing stresses in all members and connections, and

detailed shop drawings. Preliminary drawings shall be stamped by cover manufacturer's PE. Final Drawings and calculations shall bear the stamp of local state PE if required.

(b) Manufacturer's standard guarantee.

(c) A letter of certification signed and sealed by a registered Professional Civil

Engineer confirming that the aluminum cover is in full compliance with the plans and specifications including any testing provisions included therein.

III. QUALIFICATIONS

1. MANUFACTURER: Shall be a company specialized in providing engineered aluminum covers for wastewater treatment tanks/troughs for at least ten (10) years. When requested by the Engineer, submit written evidence to show experience qualifications and adequacy of plant capability and facilities for performance of contract requirements.

2. ERECTOR: Regularly engaged for at least ten (10) years in the erection of aluminum covers for wastewater treatment tanks.

3. WELDERS: Qualified within the past two (2) years in accordance with AWS.



IV. PERFORMANCE

1. SPAN: The clear span length of the cover shall be as noted in the scope of work.

2. WIDTH: The inside width of the cover shall be as noted in the scope of work.

3. DISTRIBUTED DESIGN LIVE LOAD AND DEFLECTION:

All structural components shall be designed to support the dead weight of the structure, plus a live load of 50 pounds per square foot of surface. The maximum deflection of any component under this load shall not exceed $L/240$ of the span of that component. In no event shall the dead load deflection exceed the rise of any component in order to avoid surface ponding.

4. CONCENTRATED LIVE LOAD: The structural components shall be designed to support a 400-pound load on a 6" X 6" area located anywhere on the surface of the structure without permanently deforming the tested area.

5. DESIGN STRESSES: All allowable design stresses in structural aluminum shall be in accordance with the "Specifications for Aluminum Structures" for building-type structures by the Aluminum Association.

6. SKID RESISTANCE: The cover shall possess an integral non-skid surface and no exposed area of cover system wider



than one inch shall be without ribs/non-skid surface. The aluminum-decking surface of the structure shall be Hallsten's Deck Slat, which is ribbed to provide an aggressively non-skid surface. The edges of adjacent deck slats shall double interlock so that the slats shall act together. The decking surface shall be manufactured form 6061-T6 alloy. The Manufacturer of the non-skid surface shall demonstrate in writing satisfactory performance for a minimum period of 10 years in the wastewater industry for the intended purpose. This surface shall not be achieved by the use of paint, adhesive tapes, sand blasting or any other means other than an extruded process.

7. CHEMICAL RESISTANCE: Panels shall be fabricated entirely of 6061-T6 corrosion resistant aluminum extrusions. Every panel to beam connection shall be chemical resistant and will not weaken or corrode and will interlock. A mechanical and replaceable Santoprene seal shall isolate the cover perimeter from the concrete wall. No foam tape or caulk shall be allowed.

8. CONFIGURATION: The aluminum cover shall be composed of panels and beams. All panels shall interlock with the adjoining beam and panels without the use of threaded fasteners. Uplift of each panel will be resisted with the use of an integral latch system. The weight of an individual panel shall not exceed 150 pounds. Each removable panel shall be easy to remove without disruption of adjacent panels and the lifting force required shall not exceed the dead weight of the panel.



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CORPORATION
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SACRAMENTO, CA (800) 473-7440



7. **HANDLES:** Handles shall be an integral flush mounted aluminum and incorporated into the non-skid deck slat.

VI. FABRICATION & WORKMANSHIP

1. **WORKMANSHIP:** The quality of workmanship shall be equal to the best general practice in modern structural fabrication shops. Workmanship, fabrication, and shop connections shall be in accordance with the latest edition of ANSI/AWS D1.2 "Structural Welding Code - Aluminum".

2. **EXPERIENCE:** The manufacturer must furnish adequate evidence of a minimum of ten (10) years of ongoing experience in the manufacture of similar structures.

3. **PREPARATION FOR WELDING:** All components to be welded shall be free of dirt, grease, and other contaminants and shall fit up properly for sound welding. Surfaces to be welded may not be cut with oxygen. Sawing, shearing, or machining may be used.

4. **WELDING PROCEDURES:** All welding shall be with an inert gas shield arc process. Machine settings shall be developed with test welds of the same material, alloy and geometry as the work pieces and samples will be tested destructively.

V. MATERIALS

1. **ALUMINUM:** All aluminum used in the fabrication of cover shall be alloy 6061-T6. All plate shall be alloy 6061-T6. Material shall be new and of top quality.

2. **WELDING ELECTRODES:** Welding shall be with electrodes of an alloy, which shall produce welds with strength and corrosion resistant characteristics compatible to the base metal.

3. **FASTENERS:** All fasteners between aluminum components shall be stainless steel or structural plastic. Aluminum shall be isolated from dissimilar materials by means of a stainless steel spacer or an elastomeric isolator. Beams and panels shall be fastened to concrete using stainless steel drill in place anchor bolts.

4. **STEEL ACCESSORIES:** No carbon steel components shall be used.

5. **SEALS:** A mechanical and replaceable Santoprene seal shall isolate the cover perimeter from dissimilar materials such as concrete and steel. No foam tape or caulk shall be allowed for isolation of cover system.

6. ACCESS HATCH PANELS:

Access to any location under the cover shall be gained through integral gear hinged access hatches. The Access Hatch Panels shall have the identical properties as the rest of the aluminum cover including loads, deflection and slip resistance specifications. The access-hinged panels shall be the full panel width. The length of the access panel shall be clearly indicated on drawings. Hinged panel components including hinges, decking and lifting handles shall be extruded 6061-T6. While in the closed position the hatches will be completely flush therefore posing no tripping hazard. In the open position the panel shall lie flat on the cover and will not need a hold open device.



VII. TESTING

1. LOADS: After installation the cover structure will be tested for conformance with the deflection limits. A load of 400 pounds will be placed as directed by the Engineer and the maximum deflection created by the load will be measured.

2. PREQUALIFIED SHOP TESTING: MANUFACTURER shall perform a prequalified shop air tightness test and certification for the cover components proposed. This test shall be performed in accordance with the "Procedural Standards for Testing, Adjusting and Balancing of Environment System" as published by the National Environmental Balancing Bureau (NEBB) on cover components of not less than 80 square feet. Said test shall be conducted and witnessed by a NEBB certified technician. The method of testing, test apparatus and proposed contents of the test report shall be submitted to the ENGINEER for approval. Subsequent to the receipt of ENGINEER'S approval, the MANUFACTURER shall set up testing protocol and schedule the test. The MANUFACTURER will provide the ENGINEER with at least 72 hours notice prior to the scheduled test. A report of the test shall be prepared by the certified technician and shall be sealed with the NEBB seal. The report shall include a description and illustration of the test components, a description and illustration of the test apparatus and a report of the results. The cover shall maintain an air intrusion leakage rate not to exceed 0.2 cfm per square foot at an applied negative pressure of 0.2 inches of water column for a 5-minute duration.



VIII. DELIVERY & INSTALLATION

1. DELIVERY: Delivery of the components of the structure shall be made to a location nearest the site that is accessible to over the road trucks, unless otherwise specified.

2. STORAGE: The manufacturer shall be responsible for jobsite storage of the delivered components. The components shall be stored off the ground on level surface in such a manner as to prevent damage.

3. INSTALLATION: The manufacturer shall furnish such personnel, tools, equipment, and materials as required to install the cover using the recommended procedure.

4. CONTRACTOR INSTALLATION: The cover manufacturer can provide installation instructions, on site supervision, and inspection if desired.

5. O & M MANUAL: The manufacturer shall provide an O & M Manual that includes drawings, maintenance instructions, and removal and replacement instructions for the installed cover.



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BRIDGE ACCESS HATCH PANEL (8 EA.)

AL. COVER RIM HATCH

MAILING ADDRESS:
 P.O. Box 41036
 Sacramento, CA 95841
 Tel: (916) 331-7211
 Fax: (916) 331-7223

PLANT ADDRESS:
 6944 34th Street
 North Highlands, CA 95660



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Advanced Elastomer Systems Santoprene® 103-50 Thermoplastic Rubber

Categories: Polymer; Thermoplastic; Elastomer, TPE; Thermoplastic Elastomer, Melt-Processible Rubber

Material Notes: A black thermoplastic general purpose elastomer with good fluid resistance, formulated to replace thermoset elastomers such as EPDM, polychloroprene, and chlorosulfonated polyethylene. It can be processed using injection molding, extrusion, blow molding or other melt processing techniques.

Key Features: Dielectric constant 2.3, dielectric strength at 3.17 mm (125 mil), 19.6 kV/mm (500 v/mil); UL Yellow Card listed, UL 94 HB flame rating; Continuous temperature rating 1000 hrs. @ 135°C (275°F); Excellent ozone resistance

Additional processing comments: This thermoplastic rubber is a shear-dependent material that can be processed on conventional thermoplastic equipment for injection molding, extrusion, or blow molding. For extrusion, a general purpose screw with a compression ratio of 2.5 to 3.0 is recommended. Material can be recycled. SANTOPRENE rubber is incompatible with acetal and PVC.

Values below are for injection molded plaques, side gated, 82.6 mm x 117.5 mm x 3.0 mm. Tensile properties measured across flow. Data provided by Advanced Elastomer Systems.

Vendors: No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	0.940 g/cc	0.0340 lb/in ³	TPE-0105 (ASTM D792)
Mechanical Properties	Metric	English	Comments
Hardness, Shore D	50	50	5 Second; TPE-0169 (ASTM D 2240)
Tensile Strength, Yield	11.4 MPa	1650 psi	TPE-0153 (ASTM D 412)
Elongation at Yield	40.0 %	40.0 %	TPE-0153 (ASTM D 412)
Tear Strength	90.0 kN/m	514 pli	90 kN/m at 23°C. Value at 100°C is 64 kN/m. TPE-0056 (ASTM D 624)
Compression Set	41.0 %	41.0 %	23°C, 168 hrs.; TPE-0016 (ASTM D 412)
	81.0 %	81.0 %	168 hrs.; TPE-0016 (ASTM D 412)
	@Temperature 100 °C	@Temperature 212 °F	
Tensile Set	61.0 %	61.0 %	23°C, 168 hrs.; TPE-0053 (ASTM D 412)
Electrical Properties	Metric	English	Comments
Dielectric Constant	2.30	2.30	Frequency not specified
Dielectric Strength	19.6 kV/mm	498 kV/in	
	@Thickness 3.17 mm	@Thickness 0.125 in	
Thermal Properties	Metric	English	Comments
Maximum Service Temperature, Air	135 °C	275 °F	Continuous temperature Rating, 1000 hours
Brittleness Temperature	<= -29.0 °C	<= -20.2 °F	TPE-0089 (ASTM D 746)
Flammability, UL94	HB	HB	
Processing Properties	Metric	English	Comments
Processing Temperature	177 - 232 °C	351 - 450 °F	
Drying Temperature	82.0 °C	180 °F	Desiccant drying for 3 hours recommended
Dry Time	3 hour	3 hour	

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.

Advanced Elastomer Systems Santoprene® 101-55 Thermoplastic Rubber

Categories: Polymer; Thermoplastic; Elastomer, TPE; Thermoplastic Elastomer, Melt-Processible Rubber

Material Notes: A black thermoplastic general purpose elastomer with good fluid resistance, formulated to replace thermoset elastomers such as EPDM, polychloroprene, and chlorosulfonated polyethylene. It can be processed using injection molding, extrusion, blow molding or other melt processing techniques.

Key Features: Dielectric constant 2.3, dielectric strength at 3.17 mm (125 mil), 19.6 kV/mm (500 v/mil); UL Yellow Card listed, UL 94 HB flame rating; Continuous temperature rating 1000 hrs. @ 135°C (275°F); Excellent flex fatigue resistance; Excellent ozone resistance

Additional processing comments: This thermoplastic rubber is a shear-dependent material that can be processed on conventional thermoplastic equipment for injection molding, extrusion, or blow molding. For extrusion, a general purpose screw with a compression ratio of 2.5 to 3.0 is recommended. Material can be recycled. SANTOPRENE rubber is incompatible with acetal and PVC.

Values below are for injection molded plaques, side gated, 82.6 mm x 117.5 mm x 3.0 mm. Tensile properties measured across flow. Data provided by Advanced Elastomer Systems.

Vendors: No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	0.970 g/cc	0.0350 lb/in ³	TPE-0105 (ASTM D792)
Mechanical Properties	Metric	English	Comments
Hardness, Shore A	55	55	5 Second; TPE-0169 (ASTM D 2240)
Tensile Strength, Ultimate	4.40 MPa	638 psi	TPE-0153 (ASTM D 412)
Elongation at Break	330 %	330 %	TPE-0153 (ASTM D 412)
100% Modulus	0.00200 GPa	0.290 ksi	TPE-0153 (ASTM D 412)
Graves Tear Strength	19.0 kN/m	108 pli	at 23°C. Value at 100°C is 7.3 kN/m. TPE-0056 (ASTM D 624)
Compression Set	23.0 %	23.0 %	23°C, 168 hrs.; TPE-0016 (ASTM D 412)
	25.0 %	25.0 %	168 hrs.; TPE-0016 (ASTM D 412)
	@Temperature 100 °C	@Temperature 212 °F	
Tensile Set	6.00 %	6.00 %	23°C, 168 hrs.; TPE-0053 (ASTM D 412)
Electrical Properties	Metric	English	Comments
Dielectric Constant	2.30	2.30	Frequency not specified
Dielectric Strength	19.6 kV/mm	498 kV/in	
	@Thickness 3.17 mm	@Thickness 0.125 in	
Thermal Properties	Metric	English	Comments
Maximum Service Temperature, Air	135 °C	275 °F	Continuous temperature Rating, 1000 hours
Brittleness Temperature	<= -60.0 °C	<= -76.0 °F	TPE-0089 (ASTM D 746)
Flammability, UL94	HB	HB	
Processing Properties	Metric	English	Comments
Processing Temperature	177 - 232 °C	351 - 450 °F	
Drying Temperature	82.0 °C	180 °F	Desiccant drying for 3 hours recommended

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.

C6 Adhesive



Fast Curing Epoxy for All Conditions

The hardener and resin are completely mixed as they are dispensed from the dual cartridge through a static mixing nozzle. The pre-mixed adhesive is injected directly into the anchor hole. C6 can be used with threaded rod or rebar (for fastening to hollow base materials, see pages 30 and 33).



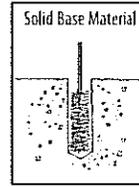
ADVANTAGES

- 1 hour cure time (see below)
- Works in damp holes and underwater applications
- Minimum shrinkage—can be used in oversized holes and diamond cored holes
- High heat deflection temperature: 140°F (ASTM D648)
- One formula for both solid and hollow base materials
- NSF standard 61 certified for drinking water systems
- Extensively tested—earthquake, underwater, creep, freeze-thaw, radiation, fire, fatigue, electrical isolation, ozone and many more test programs have been conducted on C6
- Extensive use—C6 has been used on projects all over the world for almost 20 years

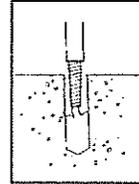
Curing Times

BASE MATERIAL (F°/C°)	WORKING TIME	FULL CURE TIME
120° / 49°	4 minutes	1 hour
90° / 32°	5 minutes	1 hour
70° / 20°	7 minutes	1 hour
60° / 16°	10 minutes	2 hours
50° / 10°	20 minutes	24 hours
40° / 4°	45 minutes	32 hours

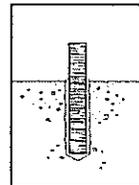
INSTALLATION STEPS



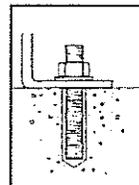
1. Drill 1/16" oversize diameter holes for 1/4"-1/2" diameter threaded rods and #3 rebar. Drill 1/8" oversize diameter holes for 5/8"-1-1/4" diameter threaded rods, #4 rebar, grout filled blocks and brick pinning. Clean out hold from bottom with forced air. Complete hole preparation with brush and repeat cleaning with forced air (leave no dust or slurry).



2. When starting new cartridge or new nozzle, dispense and discard enough adhesive until uniform grey color is achieved. Insert the nozzle into the bottom of the hole and fill to 1/2 the hole depth.



3. Insert rod slowly by hand into the bottom of the hole with a slow twisting motion. This insures adhesive fills voids and crevices and uniformly coats the anchor rod.



4. See table for working times and curing times. After the suggested cure time is met, install and tighten fixture into place.



Certified to
ANSI/NSF 61

APPROVALS/LISTINGS

ICC Evaluation Service, Inc. – ER 4285

City of Los Angeles – RR#24975

City of Los Angeles – RR#24927

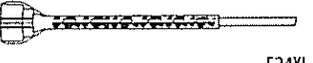
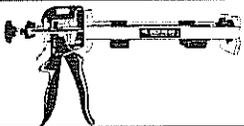
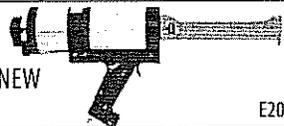
NSF Standard 61 Certified for Drinking Water Components

ASTM C881-90, Type IV, Grade 3, Class A, B, and C

DOT Approvals

C6 Adhesive Epoxy used with anchors.

C6—18 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX/BAG QTY	CARTON QTY
 C6-18	C6 Adhesive, 18 Fl. Oz. Cartridge	1	6
 E24XL	Mixing Nozzle for C6-18 Cartridge Nozzle diameter fits 9/16" holes (overall length of nozzle 10-3/8")	24	24
 E102	Hand Dispenser for C6-18 Cartridges Dispenses both 18 oz. and 22 oz. Cartridges	1	1
 E200	Pneumatic Dispenser for C6-18 Cartridge	1	1

ESTIMATING TABLE

C6 Number of Anchoring Installations Per Cartridge* 18 Fluid Ounce Cartridge Using Reinforcing Bar with C6 Adhesive in Solid Concrete

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
#3	1/2	316.7	158.4	105.6	79.2	63.3	52.8	45.2	39.6	35.2	31.7	28.8	26.4	24.4	22.6	21.1
#4	5/8	239.3	119.6	79.8	59.8	47.9	39.9	34.2	29.9	26.6	23.9	21.8	19.9	18.4	17.1	16.0
#5	3/4	183.5	91.8	61.2	45.9	36.7	30.6	26.2	22.9	20.4	18.4	16.7	15.3	14.1	13.1	12.2
#6	7/8	148.2	74.1	49.4	37.0	29.6	24.7	21.2	18.5	16.5	14.8	13.5	12.3	11.4	10.6	9.9
#7	1-1/8	71.0	35.5	23.7	17.7	14.2	11.8	10.1	8.9	7.9	7.1	6.5	5.9	5.5	5.1	4.7
#8	1-1/4	63.2	31.6	21.1	15.8	12.6	10.5	9.0	7.9	7.0	6.3	5.7	5.3	4.9	4.5	4.2
#9	1-3/8	65.9	33.0	22.0	16.5	13.2	11.0	9.4	8.2	7.3	6.6	6.0	5.5	5.1	4.7	4.4
#10	1-1/2	53.9	27.0	18.0	13.5	10.8	9.0	7.7	6.7	6.0	5.4	4.9	4.5	4.1	3.9	3.6
#11	1-3/4	33.0	16.5	11.0	8.2	6.6	5.5	4.7	4.1	3.7	3.3	3.0	2.7	2.5	2.4	2.2

ESTIMATING TABLE

CLAMPING FORCE PROVIDED ON PAGE 20

C6 Number of Anchoring Installations Per Cartridge* 18 Fluid Ounce Cartridge Using Threaded Rod with C6 Adhesive in Solid Concrete

ROD In. (mm)	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
1/4 (6.4)	5/16	587.3	293.7	195.8	146.8	117.5	97.9	83.9	73.4	65.3	58.7	53.4	48.9	45.2	42.0	39.2
3/8 (9.5)	7/16	340.0	170.0	113.3	85.0	68.0	56.7	48.6	42.5	37.8	34.0	30.9	28.3	26.2	24.3	22.7
1/2 (12.7)	9/16	244.7	122.4	81.6	61.2	48.9	40.8	35.0	30.6	27.2	24.5	22.2	20.4	18.8	17.5	16.3
5/8 (15.9)	3/4	125.2	62.6	41.7	31.3	25.0	20.9	17.9	15.7	13.9	12.5	11.4	10.4	9.6	8.9	8.3
3/4 (19.1)	7/8	99.1	49.5	33.0	24.8	19.8	16.5	14.2	12.4	11.0	9.9	9.0	8.3	7.6	7.1	6.6
7/8 (22.2)	1	82.0	41.0	27.4	20.5	16.4	13.7	11.7	10.3	9.1	8.2	7.5	6.8	6.3	5.9	5.5
1 (25.4)	1-1/8	67.6	33.8	22.5	16.9	13.5	11.3	9.7	8.4	7.5	6.8	6.1	5.6	5.2	4.8	4.5
1-1/4 (31.8)	1-3/8	51.2	25.6	17.0	12.8	10.2	8.5	7.3	6.4	5.7	5.1	4.6	4.3	3.9	3.7	3.4

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.
* Oversized holes acceptable but volume of adhesive will increase.

SUGGESTED SPECIFICATIONS

EPOXY ADHESIVE:

- Two component, 100% solid (containing no solvents), non-sag paste, insensitive to moisture, grey in color
- Meets NSF Standard 61 for use in conjunction with drinking water systems
- Meets ASTM C881-90, Type IV, Grade 3, Class A, B, and C with the exception of gel time
- Shrinkage during cure per ASTM D2566: .00051 in./in. maximum
- Compressive strength, ASTM D695: 10,300 psi minimum
- Shelf life: Best if used within 2 years
- Water solubility: None
- Heat deflection temperature, ASTM D648: 140°F minimum

PACKAGING

- Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio
- Epoxy components dispensed through a static mixing nozzle that thoroughly mixes the material, and places the epoxy at the base of the pre-drilled hole
- Cartridge markings: Include manufacturer's name, batch number and best-used-by date, mix ratio by volume, ANSI hazard classification, and appropriate ANSI handling precautions

PERFORMANCE TABLE

C6
Epoxy Adhesive

Average Ultimate Tension and Shear Loads^{1,2,3} for Threaded Rod Installed in Grout Filled Concrete Block

THREADED ROD DIA. In. (mm)	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR LOCATION	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)
3/8 (9.5)	7/16 (11.1)	3 (76.2)	GROUTED CELL	4,862 (21.6)	-- --
1/2 (12.7)	5/8 (15.9)	3 (76.2)	GROUTED CELL	4,953 (22.0)	-- --
1/2 (12.7)	5/8 (15.9)	6 (152.4)	GROUTED CELL	8,214 (36.5)	-- --
5/8 (15.9)	3/4 (19.1)	5 (127.0)	GROUTED CELL	7,355 (32.7)	-- --
3/4 (19.1)	7/8 (22.2)	6 (152.4)	Note 1	17,404 (77.4)	19,588 (87.1)
3/4 (19.1)	7/8 (22.2)	6 (152.4)	Note 2	17,404 (77.4)	8,668 (38.6)

1 Anchor can be located in grouted cell, "I" joint, or bed joint.

2 Anchor can be located in first grouted cell from edge.

3 Allowable working loads for the single installations under static loading should not exceed 25% (an industry standard) capacity or the allowable load of the anchor rod. Loads based upon testing with ASTM A193, Grade B7 rods.

PERFORMANCE TABLE

DRILL HOLE DIAMETERS
PROVIDED ON PAGE 18

C6
Epoxy Adhesive

Average Ultimate Tension and Shear Loads^{1,2,3}
for Threaded Rod Installed in Solid Concrete

THREADED ROD DIA. In. (mm)	MAX. CLAMPING FORCE AFTER PROPER CURE Ft.-Lbs. (Nm)	EMBEDMENT IN CONCRETE In. (mm)	2000 PSI (13.8 MPa) CONCRETE		4000 PSI (27.6 MPa) CONCRETE		6000 PSI (41.4 MPa) CONCRETE	
			ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)
3/8 (9.5)	13 - 18 (17.6-24.4)	3-3/8 (85.7)	7,195 (32.0)	5,209 (23.2)	8,445 (37.6)	5,869 (26.1)	10,621 (47.2)	5,941 (26.4)
		4-1/2 (114.3)	8,317 (37.0)	5,209 (23.2)	10,021 (44.6)	5,869 (26.1)	10,603 (47.2)	5,941 (26.4)
1/2 (12.7)	22 - 25 (29.8-33.9)	4-1/2 (114.3)	13,271 (59.0)	11,427 (50.8)	17,684 (78.7)	12,585 (56.0)	17,684 (78.7)	12,585 (56.0)
		6 (152.4)	19,127 (85.1)	11,427 (50.8)	19,608 (87.2)	12,585 (56.0)	19,608 (87.2)	12,585 (56.0)
5/8 (15.9)	55 - 80 (74.6-108.5)	5-5/8 (142.9)	17,704 (78.8)	18,294 (81.4)	24,526 (109.1)	19,802 (88.1)	24,526 (109.1)	19,802 (88.1)
		7-1/2 (190.5)	22,642 (100.7)	18,294 (81.4)	28,766 (128.0)	19,802 (88.1)	29,456 (131.0)	19,802 (88.1)
3/4 (19.1)	106-160 (143.7-216.9)	6-3/4 (171.5)	28,779 (128.0)	25,723 (114.4)	31,521 (140.2)	25,723 (114.4)	33,759 (150.2)	25,723 (114.4)
		9 (228.6)	31,758 (141.3)	25,723 (114.4)	41,384 (184.0)	25,723 (114.4)	41,384 (184.0)	25,723 (114.4)
7/8 (22.2)	185-250 (250.8-338.9)	7-7/8 (200.0)	35,257 (156.8)	-- --	37,714 (167.8)	30,295 (134.8)	41,023 (182.5)	32,573 (144.9)
		10-1/2 (266.7)	-- --	-- --	51,211 (227.8)	30,295 (134.8)	51,211 (227.8)	32,573 (144.9)
1 (25.4)	276-330 (374.2-447.4)	9 (228.6)	40,334 (179.4)	38,519 (171.3)	47,886 (213.0)	40,341 (179.5)	47,886 (213.0)	46,416 (206.5)
		12 (304.8)	48,719 (216.7)	38,519 (171.3)	62,194 (276.7)	40,341 (179.5)	63,053 (280.5)	46,416 (206.5)
1-1/4 (31.8)	370-660 (501.6-894.8)	11-1/4 (285.8)	55,654 (247.6)	65,085 (289.5)	56,981 (253.5)	65,085 (289.5)	-- --	65,085 (289.5)
		15 (381.0)	65,728 (289.5)	65,085 (289.5)	79,726 (354.7)	65,085 (289.5)	-- --	65,085 (289.5)

- Allowable working loads for the single installations under static loading should not exceed 25% capacity or the allowable load of the anchor rod.
- Ultimate load values in 2000, 4000, and 6000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on the use of high strength threaded rod (ASTM A193 Gr. B7). The use of lower strength rods will result in lower ultimate tension and shear loads.
- Linear interpolation may be used for intermediate spacing and edge distances (see page 22).

C6 Adhesive Anchoring System Spacing/Edge Distance Load Factor Summary^{1,2}	
LOAD FACTOR	DISTANCE FROM EDGE OF CONCRETE
Critical Edge Distance—Tension	
100% Tension Load	→ 1.25 x Anchor Embedment (or greater)
Minimum Edge Distance—Tension	
70% Tension Load	→ 0.50 x Anchor Embedment
Critical Edge Distance—Shear	
100% Shear Load	→ 1.25 x Anchor Embedment (or greater)
Minimum Edge Distance—Shear	
30% Shear Load	→ 0.30 x Anchor Embedment
LOAD FACTOR	DISTANCE FROM ANOTHER ANCHOR
Critical Spacing—Tension	
100% Tension Load	→ 1.50 x Anchor Embedment (or greater)
Minimum Spacing—Tension	
75% Tension Load	→ 0.75 x Anchor Embedment
Critical Spacing—Shear	
100% Shear Load	→ 1.50 x Anchor Embedment (or greater)
Minimum Spacing—Shear	
30% Shear Load	→ 0.50 x Anchor Embedment

- Use linear interpolation for load factors at edge distances or spacing distances between critical and minimum.
- Anchors are affected by multiple combination of spacing and/or edge distance loading and direction of the loading. Use the product of tension and shear loading factors in design.

PERFORMANCE TABLE DRILL HOLE DIAMETERS PROVIDED ON PAGE 18

C6 Epoxy Adhesive Allowable Tension Loads^{1,2,3} for Threaded Rod Installed in Solid Concrete

THREADED ROD DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	ALLOWABLE TENSION LOAD BASED ON ADHESIVE BOND STRENGTH			ALLOWABLE TENSION LOAD BASED ON STEEL STRENGTH		
		2000 PSI (13.8 MPa) CONCRETE Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE Lbs. (kN)	6000 PSI (41.4 MPa) IN CONCRETE Lbs. (kN)	ASTM A307 (SAE 1018) Lbs. (kN)	ASTM A193 GR. B7 (SAE 4140) Lbs. (kN)	ASTM F593 AISI 304 SS Lbs. (kN)
3/8 (9.5)	3-3/8 (85.7)	1,800 (8.0)	2,110 (9.4)	2,655 (11.8)	2,080 (9.3)	4,340 (19.3)	3,995 (17.8)
	4-1/2 (114.3)	2,080 (9.2)	2,505 (11.1)	2,655 (11.8)	2,080 (9.3)	4,340 (19.3)	3,995 (17.8)
1/2 (12.7)	4-1/2 (114.3)	3,315 (14.8)	4,420 (19.7)	4,420 (19.7)	3,730 (16.6)	7,780 (34.6)	7,155 (31.8)
	6 (152.4)	4,780 (21.3)	4,900 (21.8)	4,900 (21.8)	3,730 (16.6)	7,780 (34.6)	7,155 (31.8)
5/8 (15.9)	5-5/8 (142.9)	4,425 (19.7)	6,130 (27.3)	6,130 (27.3)	5,870 (26.1)	12,230 (54.4)	11,250 (50.0)
	7-1/2 (190.5)	5,660 (25.2)	7,190 (32.0)	7,364 (32.8)	5,870 (26.1)	12,230 (54.4)	11,250 (50.0)
3/4 (19.1)	6-3/4 (171.5)	7,195 (32.0)	7,885 (35.1)	8,440 (37.5)	8,490 (37.8)	17,690 (78.7)	14,860 (66.1)
	9 (228.6)	7,940 (35.3)	10,345 (46.0)	10,345 (46.0)	8,490 (37.8)	17,690 (78.7)	14,860 (66.1)
7/8 (22.2)	7-7/8 (200.0)	8,810 (39.2)	9,430 (41.9)	10,260 (45.6)	11,600 (51.6)	25,510 (113.5)	20,835 (92.7)
	10-1/2 (266.7)	—	12,080 (57.0)	12,805 (57.0)	11,600 (51.6)	25,510 (113.5)	20,835 (92.7)
1 (25.4)	9 (228.6)	10,085 (44.9)	11,970 (53.3)	11,970 (53.0)	15,180 (67.5)	31,620 (140.7)	26,560 (118.1)
	12 (304.8)	12,180 (54.2)	15,545 (69.2)	15,760 (70.1)	15,180 (67.5)	31,620 (140.7)	26,560 (118.1)
1-1/4 (31.8)	11-1/4 (285.8)	13,915 (61.9)	14,245 (63.4)	14,245 (63.4)	23,800 (105.9)	49,580 (220.6)	34,670 (154.2)
	15 (381.0)	16,340 (72.7)	19,930 (88.7)	19,930 (88.7)	23,800 (105.9)	49,580 (220.6)	34,670 (154.2)

- Use lower value of either bond or steel strength for allowable tensile load.
- Allowable loads taken from ICC Evaluation Report #4285 (formerly ICBO).
- Linear interpolation may be used for intermediate spacing and edge distances (see page 22).

PERFORMANCE TABLE

C6 Epoxy Adhesive Average Ultimate Tension Loads^{1,2,3} for Threaded Rod Installed in Solid Concrete, Shallow Embedment

ANCHOR DIAMETER In. (mm)	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT IN CONCRETE In. (mm)	3500 PSI (24.2 MPa) ULTIMATE TENSION Lbs. (kN)
1/4 (6.4)	5/16 (7.9)	1 (25.4)	1,653 (7.4)
		2-1/4 (57.2)	2,818 (12.5)
		3 (76.2)	3,599 (16.0)
3/8 (9.5)	7/16 (11.1)	1-1/2 (38.1)	3,426 (15.2)
1/2 (12.7)	9/16 (14.3)	2 (50.8)	6,100 (27.1)
5/8 (15.9)	3/4 (19.1)	2-1/2 (63.5)	8,775 (39.0)
3/4 (19.1)	7/8 (22.2)	3 (76.2)	12,625 (56.2)
7/8 (22.2)	1 (25.4)	3-1/2 (88.9)	18,650 (83.0)
1 (25.4)	1-1/8 (28.6)	4 (101.6)	25,034 (111.4)
1-1/4 (31.8)	1-3/8 (34.9)	5 (127.0)	37,100 (165.0)

- Allowable working loads for the single installations under static loading should not exceed 25% capacity or the allowable load of the anchor rod.
- Ultimate load values in 2000, 4000, and 6000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on the use of high strength threaded rod (ASTM A193 Gr. B7). The use of lower strength rods will result in lower ultimate tension and shear loads.
- Linear interpolation may be used for intermediate spacing and edge distances (see page 22).

PERFORMANCE TABLE DRILL HOLE DIAMETERS PROVIDED ON PAGE 18

REINFORCING BAR In. (mm)		EMBEDMENT IN CONCRETE In. (mm)		2000 PSI (13.8 MPa) CONCRETE ULTIMATE TENSION Lbs. (kN)		4000 PSI (27.6 MPa) CONCRETE ULTIMATE TENSION Lbs. (kN)		ULTIMATE TENSILE AND YIELD STRENGTH GRADE 60 REBAR	
								MINIMUM YIELD STRENGTH Lbs. (kN)	MINIMUM ULTIMATE TENSILE STRENGTH Lbs. (kN)
# 3 (9.5)		3-3/8 (85.7)		7,020 (31.2)		9,200 (40.9)		6,600 (29.4)	9,900 (44.0)
		4-1/2 (114.3)		9,000 (40.1)		11,540 (51.3)		6,600 (29.4)	9,900 (44.0)
# 4 (12.7)		4-1/2 (114.3)		11,940 (53.1)		15,140 (67.3)		12,000 (53.4)	18,000 (80.1)
		6 (152.4)		16,703 (74.3)		18,880 (84.0)		12,000 (53.4)	18,000 (80.1)
# 5 (15.9)		5-5/8 (142.9)		14,120 (62.8)		27,740 (123.4)		18,600 (82.7)	27,900 (124.1)
		7-1/2 (190.5)		20,040 (89.1)		30,727 (136.7)		18,600 (82.7)	27,900 (124.1)
# 6 (19.1)		6-3/4 (171.5)		17,940 (79.8)		29,200 (129.9)		26,400 (117.4)	39,600 (176.2)
		9 (228.6)		25,520 (113.5)		41,640 (185.2)		26,400 (117.4)	39,600 (176.2)
		10 (254.0)		-- --		45,000 (200.2)		26,400 (117.4)	39,600 (176.2)
# 7 (22.2)		7-7/8 (200.0)		-- --		45,850 (204.0)		36,000 (160.1)	54,000 (240.2)
		10-1/2 (266.7)		-- --		60,375 (268.6)		36,000 (160.1)	54,000 (240.2)
		13 (330.2)		-- --		65,300 (290.5)		36,000 (160.1)	54,000 (240.2)
# 8 (25.4)		9 (228.6)		30,960 (137.7)		54,180 (241.1)		47,400 (210.9)	71,100 (316.3)
		12 (304.8)		30,960 (137.7)		65,420 (291.0)		47,400 (210.9)	71,100 (316.3)
		16 (406.4)		-- --		86,700 (385.7)		47,400 (210.9)	71,100 (316.3)
# 9 (28.6)		10-1/8 (257.2)		-- --		61,530 (273.7)		60,000 (266.9)	90,000 (400.4)
		13-1/2 (342.9)		-- --		81,240 (361.4)		60,000 (266.9)	90,000 (400.4)
		19 (482.6)		-- --		108,000 (480.4)		60,000 (266.9)	90,000 (400.4)
# 10 (31.8)		11-1/4 (285.8)		44,600 (198.4)		76,500 (340.3)		76,200 (339.0)	114,300 (508.5)
		15 (381.0)		49,220 (218.9)		82,320 (366.2)		76,200 (339.0)	114,300 (508.5)
		19 (482.6)		-- --		120,000 (533.8)		76,200 (339.0)	114,300 (508.5)

1 Allowable working loads for the single installations under static loading should not exceed 25% ultimate capacity or the allowable load of the anchor rod.
 2 Ultimate load values in 2000 and 4000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on minimum Grade 60 reinforcing bar. The use of lower strength rods will result in lower ultimate tension and shear loads.
 3 SHEAR DATA: Provided the distance from the rebar to the edge of the concrete member exceeds 1.25 times the embedment depth of the rebar, calculate the ultimate shear load for the rebar anchorage as 60% of the ultimate tensile strength of the rebar.

PERFORMANCE TABLE DRILL HOLE DIAMETERS PROVIDED ON PAGE 18

THREADED ROD DIA. In. (mm)		MINIMUM EMBEDMENT DEPTH In. (mm)		ALLOWABLE SHEAR LOAD BASED ON CONCRETE STRENGTH			ALLOWABLE SHEAR LOAD BASED ON STEEL STRENGTH		
				2000 PSI (13.8 MPa) CONCRETE Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE Lbs. (kN)	6000 PSI (41.4 MPa) CONCRETE Lbs. (kN)	ASTM A307 (SAE 1018) Lbs. (kN)	ASTM A193 GR. B7 (SAE 4140) Lbs. (kN)	ASTM F593 AISI 304 SS Lbs. (kN)
3/8 (9.5)	3-3/8 (85.7)	1,300 (5.8)	1,465 (6.5)	1,500 (6.7)	1,040 (4.6)	2,170 (9.7)	1,995 (8.9)		
1/2 (12.7)	4-1/2 (114.3)	2,855 (12.7)	3,145 (14.0)	3,145 (14.0)	1,870 (8.3)	3,895 (17.3)	3,585 (15.9)		
5/8 (15.9)	5-5/8 (142.9)	4,575 (20.3)	4,950 (22.0)	4,950 (22.0)	2,940 (13.1)	6,125 (27.2)	5,635 (25.1)		
3/4 (19.1)	6-3/4 (171.5)	6,430 (28.6)	6,430 (28.6)	6,430 (28.6)	4,250 (18.9)	8,855 (39.4)	7,440 (33.1)		
7/8 (22.2)	7-7/8 (200.0)	-- --	7,575 (33.7)	8,140 (36.2)	5,800 (25.8)	12,760 (56.8)	10,730 (47.7)		
1 (25.4)	9 (228.6)	9,630 (42.8)	10,085 (44.9)	11,600 (51.6)	7,590 (33.8)	15,810 (70.3)	13,285 (59.1)		
1-1/4 (31.8)	11-1/4 (285.8)	16,270 (72.4)	16,270 (72.4)	16,270 (72.4)	11,900 (52.9)	24,790 (110.3)	18,840 (83.8)		

1 Use lower value of either concrete or steel strength for allowable shear load.
 2 Allowable loads taken from ICC Evaluation Report #4285 (formerly ICCDO).
 3 Linear interpolation may be used for intermediate spacing and edge distances (see page 22).

Combined Shear and Tension Loading—for Adhesive Anchors

Allowable loads for anchors under tension and shear loading at the same time (combined loading) will be lower than the allowable loads for anchors subjected to 100% tension or 100% shear. Use the following equation to evaluate anchors in combined loading conditions:

$$\left(\frac{N_a}{N_s}\right)^{2/3} + \left(\frac{V_a}{V_s}\right)^{2/3} \leq 1$$

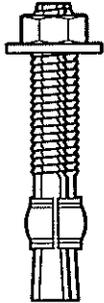
N_a = Applied Service Tension Load V_a = Applied Service Shear Load
 N_s = Allowable Tension Load V_s = Allowable Shear Load

C6 Chemical Resistance

C6 Chemical Resistance			
	HIGH Anchors installed with C6 epoxy could be submerged in these materials.	MEDIUM Intermittent exposure or temporary submersion due to splash or spill.	LOW Exposure of C6 should be limited to splash and spill exposure followed by immediate cleanup.
Xylene	✓		
Gasoline	✓		
20% Caustic (NaOH)	✓		
Fresh Water	✓		
Salt Water	✓		
10% Sulfuric Acid (H ₂ SO ₄)		✓	
3.5% Hydrochloric Acid (HCl)		✓	
9% Phosphoric Acid (H ₃ PO ₄)		✓	
Toluene		✓	
10% Nitric Acid		✓	
8.5% Ammonium Hydroxide		✓	
5% Bleach			✓
Acetone			✓
Glacial Acetic Acid			✓
Methanol			✓
Methylene Chloride			✓

Important Note: This chemical resistance table above applies only when C6 epoxy is used for installing anchors into concrete in a conventional manner with recommended hole sizes. Installation of the anchor must always be done in a drilled hole which is completely cleaned of all concrete dust and is dry. Exposure to solvents, chemicals and water, as listed above, should occur only after the C6 epoxy has fully cured.

Trubolt Wedge



SPECIFIED FOR ANCHORAGE INTO CONCRETE

Wedge anchors feature a type 18-8 stainless steel split expansion ring and a threaded stud bolt body and integral cone expander, nut and washer. Anchor bodies are made of plated carbon steel, hot-dipped galvanized carbon steel, type 304 stainless steel or type 316 stainless steel as identified in the drawings or other notations.

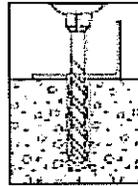
The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for

any subsequent embedment verification.

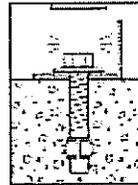
Use carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 to install anchors.

Anchors are tested to ASTM E488 criteria and listed by ICC (formerly ICBO) and SBCCI. Anchors are listed by the following agencies as required by the local building code: UL, FM, City of Los Angeles, California State Fire Marshal and Cal Trans.

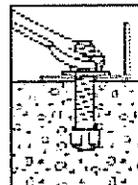
INSTALLATION STEPS



1. Using a bit whose diameter equals the anchor diameter, drill hole to any depth exceeding the minimum embedment. Clean hole.



2. Assemble anchor with nut and washer so that the top of the nut is flush with the top of the anchor. Drive anchor through material to be fastened so that nut and washer are flush with surface of material.



3. Expand anchor by tightening nut 3 to 5 turns, or to the specific torque requirement (see selection chart).

APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A.
 Specification FF-S-325 Group II, Type 4, Class 1

Underwriters Laboratories

Factory Mutual

ICC Evaluation Service, Inc. – #ER-1372 (formerly ICBO)
 (including seismic loading conditions)

Metro-Dade County – #01.0504.12

City of Los Angeles – #RR2748

SBCCI Compliance Report – #9570

California State Fire Marshal

Cal Trans

LENGTH INDICATION CODE *

CODE	LENGTH OF ANCHOR	CODE	LENGTH OF ANCHOR
A	1-1/2 < 2 (38.1 < 50.8)	K	6-1/2 < 7 (165.1 < 177.8)
B	2 < 2-1/2 (50.8 < 63.5)	L	7 < 7-1/2 (177.8 < 190.5)
C	2-1/2 < 3 (63.5 < 76.2)	M	7-1/2 < 8 (190.5 < 203.2)
D	3 < 3-1/2 (76.2 < 88.9)	N	8 < 8-1/2 (203.2 < 215.9)
E	3-1/2 < 4 (88.9 < 101.6)	O	8-1/2 < 9 (215.9 < 228.6)
F	4 < 4-1/2 (101.6 < 114.3)	P	9 < 9-1/2 (228.6 < 241.3)
G	4-1/2 < 5 (114.3 < 127.0)	Q	9-1/2 < 10 (241.3 < 254.0)
H	5 < 5-1/2 (127.0 < 139.7)	R	10 < 11 (254.0 < 279.4)
I	5-1/2 < 6 (139.7 < 152.4)	S	11 < 12 (279.4 < 304.8)
J	6 < 6-1/2 (152.4 < 165.1)	T	12 < 13 (304.8 < 330.2)

*Located on top of anchor for easy inspection.

316 Stainless Steel Wedge Anchor

ITW Ramset/Red Head®

1-800-899-7890

Trubolt Wedge Anchors

Ultimate Tension and Shear Values (Lbs/kN) in Concrete*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	f _c = 2000 PSI (13.8 MPa)		f _c = 4000 PSI (27.6 MPa)		f _c = 6000 PSI (41.4 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
1/4 (6.4)	8 (10.8)	1-1/8 (28.6)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	1,180 (5.2)	1,400 (6.2)	1,780 (7.9)	1,400 (6.2)	1,900 (8.5)	1,400 (6.2)
		1-15/16 (49.2)		2,100 (9.3)	1,680 (7.5)	3,300 (14.7)	1,680 (7.5)	3,300 (14.7)	1,680 (7.5)
		2-1/8 (54.0)		2,260 (10.1)	1,680 (7.5)	3,300 (14.7)	1,680 (7.5)	3,300 (14.7)	1,680 (7.5)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1)		1,680 (7.5)	2,320 (10.3)	2,240 (10.0)	2,620 (11.7)	2,840 (12.6)	3,160 (14.1)
		3 (76.2)		3,480 (15.5)	4,000 (17.8)	5,940 (26.4)	4,140 (18.4)	6,120 (27.2)	4,500 (20.0)
		4 (101.6)		4,800 (21.4)	4,000 (17.8)	5,940 (26.4)	4,140 (18.4)	6,120 (27.2)	4,500 (20.0)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2)		4,660 (20.7)	4,760 (21.2)	5,100 (22.7)	4,760 (21.2)	7,040 (31.3)	7,040 (31.3)
		4-1/8 (104.8)		4,660 (20.7)	7,240 (32.2)	9,640 (42.9)	7,240 (32.2)	10,820 (48.1)	8,160 (36.3)
		6 (152.4)		5,340 (23.8)	7,240 (32.2)	9,640 (42.9)	7,240 (32.2)	10,820 (48.1)	8,160 (36.3)
5/8 (15.9)	90 (122.0)	2-3/4 (69.9)		6,580 (29.3)	7,120 (31.7)	7,180 (31.9)	7,120 (31.7)	9,720 (43.2)	9,616 (42.8)
		5-1/8 (130.2)		6,580 (29.3)	9,600 (42.7)	14,920 (66.4)	11,900 (52.9)	16,380 (72.9)	12,520 (55.7)
		7-1/2 (190.5)		7,060 (31.4)	9,600 (42.7)	15,020 (66.8)	11,900 (52.9)	16,380 (72.9)	12,520 (55.7)
3/4 (19.1)	175 (237.3)	3-1/4 (82.6)	7,120 (31.7)	10,120 (45.0)	10,840 (48.2)	13,720 (61.0)	13,300 (59.2)	15,980 (71.1)	
		6-5/8 (168.3)	10,980 (48.8)	20,320 (90.4)	17,700 (78.7)	23,740 (105.6)	20,260 (90.1)	23,740 (105.6)	
		10 (254.0)	10,980 (48.8)	20,320 (90.4)	17,880 (79.5)	23,740 (105.6)	23,580 (104.9)	23,740 (105.6)	
7/8 (22.2)	250 (339.0)	3-3/4 (95.3)	9,520 (42.3)	13,160 (58.5)	14,740 (65.6)	16,580 (73.8)	17,420 (77.5)	19,160 (85.2)	
		6-1/4 (158.8)	14,660 (65.2)	20,880 (92.9)	20,940 (93.1)	28,800 (128.1)	24,360 (108.4)	28,800 (128.1)	
		8 (203.2)	14,660 (65.2)	20,880 (92.9)	20,940 (93.1)	28,800 (128.1)	24,360 (108.4)	28,800 (128.1)	
1 (25.4)	300 (406.7)	4-1/2 (114.3)	13,940 (62.0)	16,080 (71.5)	20,180 (89.8)	22,820 (101.5)	21,180 (94.2)	24,480 (108.9)	
		7-3/8 (187.3)	14,600 (64.9)	28,680 (127.6)	23,980 (106.7)	37,940 (168.8)	33,260 (148.0)	38,080 (169.4)	
		9-1/2 (241.3)	18,700 (83.2)	28,680 (127.6)	26,540 (118.1)	37,940 (168.8)	33,260 (148.0)	38,080 (169.4)	
1-1/4 (31.8)	500 (677.9)	5-1/2 (139.7)	18,140 (80.7)	23,280 (103.6)	26,380 (117.3)	29,460 (131.0)	33,640 (149.6)	33,780 (150.3)	
		8 (203.2)	27,340 (121.6)	35,080 (156.0)	43,300 (192.6)	44,260 (196.9)	45,540 (202.6)	50,560 (224.9)	

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

Trubolt Wedge Anchors

Ultimate Tension and Shear Values (Lbs/kN) in Lightweight Concrete*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	LIGHTWEIGHT CONCRETE f _c = 3000 PSI (20.7 MPa)		LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f _c = 3000 PSI (20.7 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	2,120 (9.4)	3,720 (16.5)	1,900 (8.5)	3,160 (14.1)
		3 (76.2)		2,940 (13.1)	4,240 (18.9)	2,840 (12.6)	4,000 (17.8)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2)		3,600 (16.0)	7,040 (31.3)	3,400 (15.1)	5,380 (23.9)
		3 (76.2)		4,720 (21.0)	6,620 (29.4)	4,480 (19.9)	6,620 (29.4)
5/8 (15.9)	90 (122.0)	4 (101.6)		6,920 (30.8)	6,920 (30.8)	4,800 (21.4)	6,440 (28.6)
		3 (76.2)		6,000 (26.7)	9,240 (41.1)	4,720 (21.0)	5,500 (24.5)
3/4 (19.1)	175 (237.3)	5 (127.0)		5,960 (26.5)	9,280 (41.3)	6,580 (29.3)	9,140 (40.7)
		3-1/4 (82.6)		7,160 (31.9)	12,680 (56.0)	5,840 (26.0)	8,880 (39.5)
1-1/4 (31.8)	500 (677.9)	5-1/4 (133.4)		8,900 (39.6)	15,920 (70.8)	7,040 (31.3)	

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

Trubolt Wedge Anchors Recommended Spacing and Edge Distance Requirements for Shear Loads*

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .60 In. (mm)	MIN. EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .20 In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING BETWEEN ANCHORS In. (mm) LOAD FACTOR APPLIED = .40
1/4 (6.4)	1-1/8 (28.6) 1-15/16 (49.2)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	2 (50.8)	1-5/16 (33.3)	-- --	3-15/16 (100.0)	2 (50.8)
			1-15/16 (49.2)	1 (25.4)	-- --	3-7/8 (98.4)	1-15/16 (49.2)
3/8 (9.5)	1-1/2 (38.1) 3 (76.2)		2-5/8 (66.7)	1-3/4 (44.5)	-- --	5-1/4 (133.4)	2-5/8 (66.7)
			3-3/4 (95.3)	3 (76.2)	1-1/2 (38.1)	6 (152.4)	3 (76.2)
1/2 (12.7)	2-1/4 (57.2) 4-1/8 (104.8)		3-15/16 (100.0)	2-9/16 (65.1)	-- --	7-7/8 (200.0)	3-15/16 (100.0)
			5-3/16 (131.8)	3-1/8 (79.4)	1-9/16 (39.7)	6-3/16 (157.2)	3-1/8 (79.4)
5/8 (15.9)	2-3/4 (69.9) 5-1/8 (130.2)		4-13/16 (122.2)	3-1/8 (79.4)	-- --	9-5/8 (244.5)	4-13/16 (122.2)
			6-7/16 (163.5)	3-7/8 (98.4)	1-15/16 (49.2)	7-11/16 (195.3)	3-7/8 (98.4)
3/4 (19.1)	3-1/4 (82.6) 6-5/8 (168.3)		5-11/16 (144.5)	3-3/4 (95.3)	-- --	11-3/8 (288.9)	5-11/16 (144.5)
			6-5/16 (160.3)	5 (127.0)	2-1/2 (63.5)	9-15/16 (252.4)	5 (127.0)
7/8 (22.2)	3-3/4 (95.3) 6-1/4 (158.8)		6-9/16 (166.7)	4-5/16 (109.5)	-- --	13-1/8 (333.4)	6-9/16 (166.7)
			8-1/2 (215.9)	6-1/4 (158.8)	3-1/8 (79.4)	12-1/2 (317.5)	6-1/4 (158.8)
1 (25.4)	4-1/4 (108.0) 7-3/8 (187.3)	7-7/8 (200.0)	5-1/8 (130.2)	-- --	15-3/4 (400.1)	7-7/8 (200.0)	
		10-1/16 (255.6)	7-3/8 (187.3)	3-11/16 (93.7)	14-3/4 (374.7)	7-3/8 (187.3)	
1-1/4 (31.8)	5-1/2 (139.7) 8 (203.2)	9-5/8 (244.5)	6-1/4 (158.8)	-- --	19-1/4 (489.0)	9-5/8 (244.5)	
		11-7/16 (290.5)	8 (203.2)	4 (101.6)	16 (406.4)	8 (203.2)	

* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

Trubolt Wedge Anchors Recommended Spacing and Edge Distance Requirements for Tension Loads*

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE EDGE DISTANCE AT WHICH THE LOAD FACTOR APPLIED = .65 In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING AT WHICH THE LOAD FACTOR APPLIED = .70 In. (mm)
1/4 (6.4)	1-1/8 (28.6) 1-15/16 (49.2) 2-1/8 (54.0)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	2 (50.8)	1 (25.4)	3-15/16 (100.0)	2 (50.8)
			1-15/16 (49.2)	1 (25.4)	3-7/8 (98.4)	1-15/16 (49.2)
			1-5/8 (41.3)	13/16 (20.6)	3-3/16 (81.0)	1-5/8 (41.3)
3/8 (9.5)	1-1/2 (38.1) 3 (76.2) 4 (101.6)		2-5/8 (66.7)	1-5/16 (33.3)	5-1/4 (133.4)	2-5/8 (66.7)
			3 (76.2)	1-1/2 (38.1)	6 (152.4)	3 (76.2)
			3 (76.2)	1-1/2 (38.1)	6 (152.4)	3 (76.2)
1/2 (12.7)	2-1/4 (57.2) 4-1/8 (104.8) 6 (152.4)		3-15/16 (100.0)	2 (50.8)	7-7/8 (200.0)	3-15/16 (100.0)
			3-1/8 (79.4)	1-9/16 (39.7)	6-3/16 (157.2)	3-1/8 (79.4)
			4-1/2 (114.3)	2-1/4 (57.2)	9 (228.6)	4-1/2 (114.3)
5/8 (15.9)	2-3/4 (69.9) 5-1/8 (130.2) 7-1/2 (190.5)		4-13/16 (122.2)	2-7/16 (61.9)	9-5/8 (244.5)	4-13/16 (122.2)
			3-7/8 (98.4)	1-15/16 (49.2)	7-1/16 (195.3)	3-7/8 (98.4)
			5-5/8 (142.9)	2-13/16 (71.4)	11-1/4 (285.8)	5-5/8 (142.9)
3/4 (19.1)	3-1/4 (82.6) 6-5/8 (168.3) 10 (254.0)	5-11/16 (144.5)	2-7/8 (73.0)	11-3/8 (288.9)	5-11/16 (144.5)	
		5 (127.0)	2-1/2 (63.5)	9-15/16 (252.4)	5 (127.0)	
		7-1/2 (190.5)	3-3/4 (95.3)	15 (381.0)	7-1/2 (190.5)	
7/8 (22.2)	3-3/4 (95.3) 6-1/4 (158.8) 8 (203.2)	6-9/16 (166.7)	3-5/16 (84.1)	13-1/8 (333.4)	6-9/16 (166.7)	
		6-1/4 (158.8)	3-1/8 (79.4)	12-1/2 (317.5)	6-1/4 (158.8)	
		6 (152.4)	3 (76.2)	12 (304.8)	6 (152.4)	
1 (25.4)	4-1/2 (114.3) 7-3/8 (187.3) 9-1/2 (241.3)	7-7/8 (200.0)	3-15/16 (100.0)	15-3/4 (400.1)	7-7/8 (200.0)	
		7-3/8 (187.3)	3-11/16 (93.7)	14-3/4 (374.7)	7-3/8 (187.3)	
		7-1/8 (181.0)	3-9/16 (90.5)	14-1/4 (362.0)	7-1/8 (181.0)	
1-1/4 (31.8)	5-1/2 (139.7) 8 (203.2)	9-5/8 (244.5)	4-13/16 (122.2)	19-1/4 (489.0)	9-5/8 (244.5)	
		8 (203.2)	4 (101.6)	16 (406.4)	8 (203.2)	

* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

Combined Shear and Tension Loading—for Trubolt Anchors

Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation:

$$(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} \leq 1$$

P_s = Applied tension load

V_s = Applied shear load

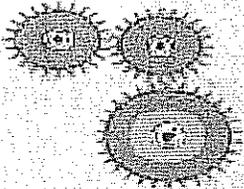
P_t = Allowable tension load

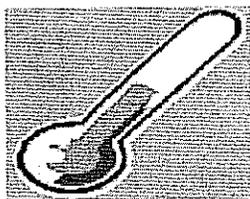
V_t = Allowable shear load

ITW Ramset/Red Head 316 Stainless Steel Wedge Anchor

1-800-899-7890

Specifications for UHMW®

	Property	Units	Test Method ASTM	UHMW®
Physical 	Water Absorption (24 Hours)	%	D570	>.01
Mechanical 	Tensile Strength (73 °F)	PSI	D638	4750
	Shear Strength (73 °F)	PSI	D732	3500
	Impact Strength, Notched Izod (73 °F)	Ft-Lbs/In.	D256	no break
	Elongation at Break (73 °F)	%	D638	325
	Tensile Modulus of Elasticity (73 °F)	PSI	D638	90000
	Flexural Modulus of Elasticity (73 °F)	PSI	D790	110000
	Hardness - Rockwell & Burnell (73 °F)	Various Scales	D785	R64
	Density	Lbs/In.	-	.034
	Coefficient of Friction (Dynamic)	None	-	.12
	Wear Factor (K)	In. - min./Ft-Lbs-Hr	-	111
	Limiting PV	PSI/FPM	-	2000
Abrasion Resistance Index	None	-	10	
Thermal	Coefficient of Linear Thermal Expansion	In./In./F	D696	7.2×10^5
	Continuous Service Temperature - in Air (max.)	F	-	160



Deflection Temperature
(264 PSI)

F

D648

116

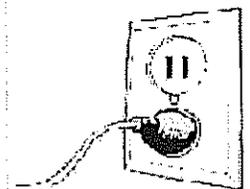
Deformation Under Load
(2000 PSI, 122 °F)

%

D621

7

Electrical



Volume Resistivity

Ohm-
CM

D257

1×10^{-18}

Dielectric Constant (60 Hz)

None

D150

2.3

CHEMICAL RESISTANCE CHART

WARNING

The following data is based on tests and believed to be reliable; however the tabulation should be used as a guide ONLY, since it does not take into consideration all variables, such as elevated temperatures, fluid contamination, concentration, etc. that may be encountered in actual use. All critical applications should be tested. Note: all data based on 70° F unless other wise noted.

TRADE NAME	DESCRIPTION	TRADE NAME	DESCRIPTION
BUTYL	ISOBUTYLENE-ISOPRENE	CPE	CHLORINATED POLYETHYLENE
EPDM	ETHYLENE PROPYLENE-DIENE	HYPALON	CHLOROSULTONYL POLYETHYLENE
HYTREL	THERMOPLASTIC POLYESTER	NATURAL	NATURAL RUBBER
NEOPRENE	POLYCHLOROPREN	NITRILE	ACRYLONITRILE
NYLON	NYLON POLYMER	SBR	STYRENE-BUTADIENE
SANTOPRENE	ETHYLENE-PROPYLENE-DIENE	TEFLON	FLUOROCARBON RESIN
UHMW	ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE	URETHANE	URETHANE
VITON	FLOROELASTOMER	XLPE	CROSS-LINKED POLYETHYLENE

KEY:
 E = EXCELLENT
 G = GOOD
 F = FAIR
 C = CDNDITIONAL
 X = UNSATISFACTORY
 BLANK = NO DATA
 CHEMICAL OR MATERIAL CONVEYED

CHEMICAL OR MATERIAL CONVEYED	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
ACETALDEHYDE	E		G	C			F	X	E	X		G	G	X		E
ACETIC ACID, GLACIAL	G	G	G	X	E	X	X	C	X	X	X	C	E	X	X	E
ACETIC ACID-10%	E	E	E	F	E	F	F	X	E	F	E	G	E	X	C	E
ACETIC ACID-50%	E	E	E	X	E	G	X	X	C	X	G	G	G	X	V	E
ACETIC ANHYDRIDE	E	E	E	G	C	F	G	X	G	X	X	G	G	X	X	E
ACETIC OXIDE	E	E		G		F				G		E			X	E
ACETONE	E	E	E	F	G	C	X	X	E	C	E	G	E	X	X	E
ACETONE CYANDHYDRIN	E	E		F		F				F			G		X	E
ACETONITRILE		E										F				
ACETOPHENONE	E		E	X		X	X	X		X			X	X	X	X
ACETYL ACETONE	G	G	E	X		X	X	X		X		G	E	X	X	E
ACETYL CHLORIDE	X	E	X	X		X	X	X		X			G	X	E	G
ACETYL OXIDE	E	E		G		F				G		E	E		X	E
ACETYLENE	E		E	E	E	E	G	E	E	E			E	C	E	E
ACETYLENE DI+ TETRA CHLORIDE	X			X		X				X					G	G
ACROLEIN	E			G		G				F		G			E	E
ACRYLENITRILE	X	E	X	C		X	X	X	G	X				X	X	C
ACRYLIC ACID		E														
ADIPIC ACID	E		G	E			G	G		G				E		
AIR, +300F			X	X		X	X	X		X			X	X	X	
ALK-TRI	X			X		X		X							E	E
ALLYL ALCOHOL	E	E		E		E				E			E		E	E
ALLYL BROMIDE	X	G		X		X				X			G		G	G
ALLYL CHLORIDE	X	G		X		X				X		E	G		G	G
ALUM	E	E	E	E		E	E	E	C	E		E	E		E	E
ALUMINUM ACETATE (AQ)	G	E	E			X	G	F		X		E	E	X	X	E
ALUMINUM CHLORIDE(AQ)-40%	E	E	E	E	C	E	E	E	X	E		E	E	E	E	E
ALUMINUM FLUORIDE	E		E	E		G	E	E	X	E			E	C	C	E
ALUMINUM FORMATE	G			X		X				X			E		X	E
ALUMINUM HYDROXIDE		E		G		E	E	G				E	E			
ALUMINUM NITRATE (AQ)	E	E	E	E		E	E	E		E		E	E	C	E	E
ALUMINUM SULFATE (AQ)	E	E	E	E	C	E	E	E	X	E		E	E	X	E	E
ALUMS-NH3-CR-K	E		E	E		E	E	E	X	E					E	
AMINES-MIXED	G		G	X		G	G	X		G				X	X	
AMINO BENZENE		G														
AMINODIMETHYLBENZENE		C														

CHEMICAL RESISTANCE CHART

KEY:
 E = EXCELLENT
 G = GOOD
 F = FAIR
 C = CONDITIONAL
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 BLANK = NO DATA
 CHEMICAL OR MATERIAL CONVEYED

BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMW URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
AMINOETHANE			E													
AMINOXYLENE			C													
AMMONIUM CARBONATE (AQ)	E			E			E	E	X	G	E				G	C
AMMONIUM CHLORIDE (AQ)	E	E	E	E	E	E	E	E	X	E		E	E	E	E	C
AMMONIUM HYDROXIDE	E	E	E	E	G	C	X	E	X	E	X		E	E	X	C
AMMONIUM NITRATE (AQ)	E			E	E			E	E	E	E		E	E	X	C
AMMONIUM PHOSPHATE, DIBASIC	E	E	E	E			E	E	E	E	E		E	E		C
AMMONIUM SULPHATE (AQ)	E	E	E	E	E	C	E	E	E	E	E		E	E	E	X
AMMONIUM SULPHITE	E	E		E			E					E				E
AMMONIUM THIOSULPHATE	E	E		E			E			E		E			G	E
AMYL ACETATE	E	C	X	X	C	X	X	X	E	X	X	C	E	X	X	E
AMYL ACETONE	G			X		X				X						X
AMYL ALCOHOL	E	E	E	E	E	E	E	G	X	E	E	X	E	E	X	G
AMYL BROMIDE		C														
AMYL CHLORIDE	X	G	X	X			X	X			X		E	E	C	G
AMYL ETHER		E														
AMYLAMINE	E	G		F			G					G				
ANETHOLE	X	X		X			X			G	X			G		G
ANILINE	E	G	C	X	X	X	X	X	X	X	E	E	E	E	X	C
ANILINE DYES	G	G	G	G			G	G	X	X	G		F	E	X	G
ANILINE OIL	G		G	X			X	X	X		X				X	C
ANIMAL FATS	G	E	C	X	C	X	C	E	E	X	X		E	C	E	E
ANTIMONY PENTACHLORIDE	X			X			X			X						E
AQUA REGIA	X	G	C	C			X	X	X		X		E	X	X	G
ARGON	G		E	X	E		X	X	C	E	X		E	E	E	E
ARSENIC ACID	E	E	E	E			E	E	E		E		E		C	E
ASPHALT	X		X	X	C	X	X	X	E	X		E	X	G	E	X
ASTM FUEL A	X	E	X	G	E	X	E	E	E	X	X	E	G	E	E	G
ASTM FUEL B	X	G	X	X	E	X	X	E	E	X	X	E	G	E	E	G
ASTM FUEL C	X	G	X	X	E	X	X	G	E	X	X	E	G	X	E	G
ASTM OIL NO. 1	X	E	X	G	E	X	E	E	E	X	X	E	E	E	E	E
ASTM OIL NO. 2	X	E	X	X	E	X	G	E	E	X	X	E	E	E	E	E
ASTM OIL NO. 3	X	G	X	X	C	X	X	E	E	X	X	E	E	E	E	E
ASTM OIL NO. 4	X		X	X			X	X	G		X		E	X	E	E
AUTOMATIC TRANSMISSION FLUID	X	E	X	C			X	G	E		X		E	G	E	E
BANANA OIL	C	G	C						X	X			E			E
BARIUM CHLORIDE (AQ)	E	E	E	E			E	E	E	X	E		E	E	E	E
BARIUM HYDROXIDE (AQ)	E	E	E	E	C	E	E	E	E	E	E		E	E	E	E
BARIUM SULFIDE (AQ)	E	E	E	E			E	E	E	F	E		E	E	E	E
BEER	E	E	G	E	G	E	G	C	G	E		E	E	X	E	E
BEET SUGAR LIQUORS	E	E	E	E			E	G	E	E	E		E	G	X	E
BENZAL CHLORIDE	G	X											E			E
BENZALDEHYDE	E	C	E	X	X	X	X	X	E	X	X	C		X	X	E
BENZENE	X	X	X	X	C	X	X	X	E	X	X	G	G	X	E	E
BENZENE CARBOXYLIC ACID		E														
BENZINE	X		X	X			X	G	E	E	X		E		G	E
BENZOIC ACID	X	E	X	X			X	X	X	G	X		G		X	E
BENZOL		G	X						X	F			E	G		
BENZOTRICHLORIDE		X											G			G

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	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
BENZYL ACETATE	G	G		X		X				X			E		X	E
BENZYL ALCOHOL	X	E	X	F		X	C	X	C	X	X	E	E	X	E	E
BENZYL CHLORIDE	G	X	G	C		C	X	X		C		E	E		C	E
BENZYL ETHER		C														
BIS (2-CLOROETHYL) ETHER		G														
BLACK SULFATE LIQUOR	E		E	G		G	G	G	F	G		E	E	X	E	
BLEACH (2-15%)	G		G	F		X	X	X		X		E	E	X	G	G
BORAX SOLUTION	E	E	E	E	E	G	E	C	E	G	G	E	E	G	E	E
BORIC ACID		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
BRAKE FLUID (HD-557) 12 DAYS	G	E	E	G			G	C	E	E		E			X	
BRINE	E	E	E	E		E	E	F	C	E		E	E		E	E
BROMACIL			E													
BROMOBENZENE	X	X	X	X		X	X	X		X			C	X	G	C
BROMOCHLOROMETHANE	G	G	G	X		X	X	X		X					X	G
BROMOETHANE		G														
BROMOTOLUENE	X	X		X		X				X					G	F
BUGDIOLXANE																E
BUNKER OIL	X		X	X		X	X	E		E		E		G	E	E
BUTADIENE	X		X	C		X	X	X		X		E		X	G	E
BUTANE	E	G	X	G	E	X	E	E	E	X		E	E	E	E	E
BUTANOIC ACID		E														
BUTANOL (BUTYL ALCOHOL)	E	E	G	E	E	E	E	E	E	E	G	E	E	G	E	E
BUTANONE		G			X			X	E		X	G	E	X		E
BUTOXYETHANOL		E														
BUTYL ACETATE	G	G	C	X	C	X	X	X		X		C	E	X	X	E
BUTYL ACRYLATE	X	G	X	X		X	X	X					G		X	G
BUTYL ALCOHOL	E	E	E	E		E	E	E		E		G	E	G	E	E
BUTYL ALDEHYDE	E	G				F							E		X	E
BUTYL BENZYL PHTHALATE	E		E	X		X	X	C		X			E		C	E
BUTYL CARBITOL	E	E	E	C		X	C	X		X		E	E		C	C
BUTYL CELLUSOLVE	E	E	G	X		X	X	C		X		E	E	E	X	E
BUTYL CHLORIDE	F	C		X		X				X			C		G	G
BUTYL ETHER	C	E	C	X		X	X	C		X			E	G	X	E
BUTYL ETHER ACETALDEHYDE	E			X		X				X			E		X	E
BUTYL ETHYL ETHER	G			X		X				X			E			E
BUTYL OLEATE	G		G	X		X	X	X		X					E	
BUTYL PHTHALATE	E	C		X		X				X					F	E
BUTYL STEARATE	X	G	X	X		X	X	G		X		E	E		C	E
BUTYLENE	X		X	X		X	C	G		X				X	E	
BUTYRALDEHYDE	E	G	G	X		X	X	X		X		E	E	X	X	E
BUTYRIC ACID	F	E	G	X	C	F	X	X		X		E	E		G	E
BUTYRIC ANHYDRIDE	F			G		F				X		E			X	E
CADMIUM ACETATE	G	E		X		X				X			E			E
CALCIUM ALUMINATE	E			E		E				E					E	E
CALCIUM BICHROMATE	E			F												G
CALCIUM BISULFIDE			X		G		C	E	F			E				
CALCIUM CHLORIDE	E	E	E	E	E	E	E	E	C	E		E	E	E	E	E
CALCIUM HYDROXIDE	E	E	E	G	E	E	E	E	E	G		E	E	E	E	E
CALCIUM HYPOCHLORITE	G	E	E	F	E	X	X	X	X	X		E	C	X	X	C

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BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMWV URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMWV	URETHANE	VITON	XLPE
CALCIUM NITRATE	E	E	E	E		E	E	E	E	E		E	E	E	E	E
CALCIUM SULFIDE	E	E	E	E		E	E	G		E		E	E	E	E	E
CALCIUM ACETATE	G	E	E	X		X	G	G		X		E	E	X	X	E
CAPRYLIC ACID	F	E		G		F				X			E			E
CARBAMIDE		E														
CARBITOL	F	E	G	X		X	G	G		X		E	E	X	G	E
CARBOLIC ACID PHENOL	E	E	G	X		X	X	X		X		E	E		E	E
CARBON DIOXIDE	E		C	E	E	E	C	X	E	E		E	E	E	G	E
CARBON DISULFIDE	X	C	X	X		X	X	X	X	X		E	E	X	E	C
CARBON MONOXIDE	E		C	E	E	E	C	E	E	G		E	E	G	E	E
CARBON TETRACHLORIDE	X	X	X	X	C	X	X	X	G	X	X	E	G	X	E	G
CARBONIC ACID	E	E	G	E	X	E	X	X	X	E	X	E		X	E	E
CASTOR OIL	E	E	G	E	G	F	E	E	E	G		E	E	G	E	E
CAUSTIC SODA (SEE SODIUM HYDROXIDE)																
CELLOSOLVE ACETATE	E		G	X		X	X	X	F	X		E	E	X	X	E
CELLUGUARD	E		G	E		E	E	E	E	E		E		X	E	
CETYLIC ACID		E														
CHINA WOOD OIL (TUNG OIL)	C		X	X		X	G	E		X				C	E	
CHLORINATED SOLVENTS	X		X	X		X	X	X	C	X		E		X	E	G
CHLORO-2-PROPANONE		X														
CHLOROACETIC ACID	F		X	X	X	X	X	X	X	X	X	C	E	X	X	E
CHLOROACETONE	G	X	E	X		X	X	X		X		E	E	X	X	E
CHLOROBENZENE	X	X	X	X	X	X	X	X	E	X	X	E	G	X	E	G
CHLOROBUTANE	F	C		X		X				X			G		E	G
CHLORODANE			E					E								
CHLOROETHYL BENZENE	X	X		X		X				X			E		G	E
CHLOROFORM	X	X	X	X	X	X	X	X	X	X	X	E	E	X	E	G
CHLOROPENTANE	X	G		X		X				X			E		E	E
CHLOROSULFONIC ACID	X	X	X	X	X	X	C	X	X	X		C	X	X	X	G
CHLOROTOLUENE	X	X	X	X		X	X	X		X		E	G	X	G	G
CHLOROX	G	E	G	G		X	G	G		X			G	X	E	
CHROME PLATING SOLUTIONS	X		G	X		X	X	X		X			E	X	E	
CHROMIC ACID	F	E	C	G	X	X	X	X	X	X	X	E	E	X	C	G
CHROMIUM TRIOXIDE		E														
CINNAMENE		C														
CIS-9-OCTADECENOIC ACID	G	E		X		X				X					C	E
CITRIC ACID	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E
COAL OIL	X		X	X		X		X	E	X	X		E		E	E
COAL TAR	X		X	X		X	G	E		X			E		E	E
COAL TAR NAPHTHA	X			X		X				X					E	E
COCONUT OIL	G		C	X		X	G	E		X		E	E	C	C	E
COKE OVEN GAS	X		X	X		X	X	X	E	X		C		X	E	E
COOLANOL (MONSANTO)			X	G	X	X	E	E		X				X	E	
COPPER CHLORIDE	E	G	E	E	E	F	C	C	C	E		X	E	G	E	E
COPPER CYANIDE	E		E	E		E	E	E		E		E	E	E	E	E
COPPER HYDRATE	E			G		F				G			E		F	E
COPPER HYDROXIDE	E			G		F				G					F	E
COPPER SULFATE	E	E	E	E	E	F	E	E	X	E		E	E	G	E	E
CORN OIL	E	G	C	X	G	X	C	E	G	X		G	E	G	E	E

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	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	UTON	XLPE
COTTONSEED OIL	C	G	C	X	G	X	C	C	E	X		E	E	G	E	C
CREOSOTE	X		X	X		X	C	C	X	X	X	E	E	C	E	E
CRESOLS	X	E	X	X		X	X	X	X	X	X	E	E	X	E	E
CRESYLIC ACID	X		X	X		X	X	X		X		E	E	X	E	E
CROTONALDEHYDE	E	E		X		X				X			E		X	E
CRUDE OIL	X		X	X		X	X	G	E	X		E	E		E	E
CUMENE	X	C	X	X		X	X	X		X		E	E	X	E	E
CUPRIC CARBONATE	E	E		E		F				E			E		E	E
CUPRIC HYDROXIDE		E														
CUPRIC NITRATE	E	E		E		F				E			E	G	E	E
CUPRIC SULFATE	E	E		E		F				E			E	G	E	E
CUTTING OIL	X		X	G		X	G	E		X		E		E	E	
CYCLOHEXANE	X	E	X	X	E	X	X	G	E	X	X	E	E	G	X	E
CYCLOHEXANOL	X	E	X	X		X	G	C	E	X	X	E	E		E	E
CYCLOHEXANONE	X	C	X	X		X	X	X	E	X	X	E	E	X	X	E
CYCLOPENTANE	X	G		X		X				X			E		E	E
CYCLOPENTANOL	X	E		X		X				X			E		G	E
CYCLOPENTANONE	X	G		X		X				X						E
CYCLOPENTYL ALCOHOL		E														
D-FURALDEHYDE		E														
DDT IN KEROSENE	X		X	X		X	F	E	E	X		E			E	E
DECAHYDRONAPHTHALENE		C														
DECAHYDROXYNAPHTHALENE		C														
DECALIN	X	X	X	X		X	X	X		X		E	X		E	E
DECYL ALCOHOL	E	E		E		E				E			E		G	E
DECYL ALDEHYDE	E			X		X				X			E		X	E
DECYL BUTYL PHTHALATE	E			X		X				X			E		F	E
DECYL CARBINOL		E														
DETERGENT, WATER SOLUTION	E	G	E	G		G	G	E		G		E		X	E	
DEVELOPING FLUID (PHOTO)	G		G	E		E	E	E		G					E	
DEXTRON	X		X	X		X	G	E		X				G	E	
DI(2ETHYLHEXYL) ADIPATE		C														
DI(2ETHYLHEXYL) PHTHALATE		C														
DI-ISO-BUTYLENE	X		X	X		X	X	G		X				X	E	E
DI-ISO-DECYL PHTHALATE		E														
DI-ISO-PROPANOLAMINE	E	E														
DI-ISO-PROPYL ETHER	F	E		X		X				X						E
DI-ISO-PROPYL KETONE	G	C	E	X		X	X	X		X		E		X	X	E
DI-P-MENTHA-1,8-DIENE		G														
DIACETONE ALCOHOL	E	E	X	X		X	X	X		X		E	E	X	X	C
DIACETYLMETHANE		E														
DIALLYLPHTHALATE		G														
DIAMMONIUM PHOSPHATE									E							
DIAMYL NAPHTHALENE	E			X		X				X					F	E
DIAMYLAMINE	E	E		G		F				G						
DIAMYLENE	X	G		X		X				X					E	E
DIAMYLPHENOL	X	E		X		X				X					E	E
DIBENZYL ETHER	E	C	X	X		X	X	X		X		E	E	G	X	E
DIBROMOBENZENE	X			X		X				X			G		E	E

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BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMW URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE		
DIBROMOMETHANE			C											E	E	C	C	E
DIBUTYL ETHER	G	E	C	X		X	X	X		X			E	E	X	C	E	
DIBUTYL PHTHALATE	C	C	C	X	E	X	X	X	E	X			E	E	X	F	E	
DIBUTYL SEBACATE	E	G	G	X		X	X	X		X			E	E	X	X		
DIBUTYLAMINE	X	E	X	X		X	X	X		X			E	E	X	X		
DICALCIUM PHOSPHATE	E			E		E				E						E	E	
DICHLORO ETHYLENE					X				C		X				C			
DICHLOROACETIC ACID	F	G		X		G				X						X	E	
DICHLOROBENZENE	X	X	X	X	X	X	X	X	E	X	X	G	E	X	E	G		
DICHLOROBUTANE	X	C	C	C	C	C	C	G		X			E	X	E	E		
DICHLORODIFLUOROMETHANE	X			X		X				X						G		
DICHLOROETHANE	X	C		X		X				X						E	E	
DICHLOROETHYL ETHER	X	G		X		X				X							E	
DICHLOROHEXANE	X	C		X		X				X			E			E	E	
DICHLOROMETHANE	X	C		X		X				X			E			E	E	
DICHLOROPENTANE	X	C		X		X				X			E	E		E	E	
DICHLOROPROPANE	X	C		X		X				X			E	E		E	E	
DICHLOROPROPENE													E	E		E	E	
DICHLOROTOLUENE		X																
DIESEL OIL	X		X	C	C	X	C	E	E	X	X	E	E	C	E	C		
DIETHANOL AMINE	E	E		F	C	G				G			E					
DIETHLBENZINE	X	C	X	X		X	X	X		X			E	X	E	E		
DIETHYL ETHER	X	E	X	X		X	C	X	G	X		G		G	X	E		
DIETHYL KETONE	G	C		X		F				X					X	E		
DIETHYL OXALATE	E	E		X		E				E							E	
DIETHYL PHTHALATE	E	G	G	X	E	X	X		E	X		E	E		F	E		
DIETHYL SEBACATE	E	G	C	X	G	X	X	X		X	E			X	E			
DIETHYL SULFATE		E																
DIETHYLAMINE	E	E	G	C		G	C	C		G		E	E	C	X	C		
DIETHYLENE GLYCOL	E	E	E	E		E	E	E		E			E	X	E	C		
DIETHYLENE OXIDE		G																
DIETHYLENETRIAMINE	E	E		F		G				G			E					
DIETHYLTRIAMINE	E	E		F		G				G								
DIHYDROXY DIETHYL ETHER		E																
DIHYDROXY SUCCINIC ACID		E																
DIHYDROXYDIETHYL ETHER	E			E		E				E						E		
DIISOBUTYL KETONE	G		G	X		X	X	X		X			E		X	E		
DIISODECTYL PHTHALATE	E			X		X				X			E		F	E		
DIISOCTYL ADIPATE	E			X		X				X			E		F	E		
DIISOCTYL PHTHALATE	E			X		X				X			E		F	E		
DIMETHYL CARBINOL		E												E				
DIMETHYL KETONE		E												E				
DIMETHYL PHTHALATE	G	E	G	X		X	X	X		X		E	E		G	E		
DIMETHYL SULFATE		E																
DIMETHYL SULFIDE		G																
DIMETHYL-3-PENTANONE		G																
DIMETHYL-4-HEPTANONE		C																
DIMETHYLAMINE		E											E	E			E	
DIMETHYLANILINE	C	C	G	X			C	C		C		E	G					

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ETHYLAMINE	G	E		F		F				F				E		
ETHYLENE CHLOROHYDRIN	G		C	G	X	G	C	X		G	X	E	E	X	E	E
ETHYLENE DIAMINE	E	G	E	F		G	E	E		G		E	G	X	X	E
ETHYLENE DIBROMIDE	X	C	C	X		X	X	X		X			G	X	G	G
ETHYLENE DICHLORIDE	X	C	X	X	X	X	X	X	E	X	X	E	G	X	G	G
ETHYLENE G MONOETHYL E ACETATE										E						
ETHYLENE G MONOBUTYL ETHER																E
ETHYLENE G MONOETHYL ETHER																E
ETHYLENE G MONOHEXYL ETHER																E
ETHYLENE GLYCOL	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	C
ETHYLENE OXIDE	C		C	X	E	X	X	X	E	X	X	X		X	X	
FATTY ACIDS	X	G	X	X		X	C	C	E	X	X	E	E		E	E
FERRIC BROMADE	E			E		E				E			E		E	E
FERRIC CHLORIDE	E	E	E	E	C	E	G	E	X	E		E	E	E	E	E
FERRIC NITRATE	E	E	E	E		E	E	E	E	E		E	E	E	E	E
FERRIC SULFATE	E	E	E	E		E	E	E	X	E		E	E		E	E
FERROUS ACETATE	G			X		X				X					X	E
FERROUS CHLORIDE	E		E	E	E	E	E	E	E	E		E	E	E	E	E
FERROUS SULFATE	E	E	E	E	E	E	E	G	E	E		E	E	E	E	E
FLUOBORIC ACID	E	E	E	E		E	C	C		G		E	C		C	C
FLUORINE	C		X			X	X	X	X	X	X	X	X	X	X	G
FLUOSILICIC ACID	E	E	E	E	C	E	C	C		C		E	C		C	C
FORMALDEHYDE	E	E	G	C	C	G	C	X	E	C	E	E	E	X	X	E
FORMALIN	E	E		E		G				G					E	E
FORMIC ACID	E	E	E	F	C	G	C	X	X	G	E	E	E	X	X	C
FREON 502			E									X	E			
FREON 113			C	E	E	C	E	E		G	X	E			G	
FREON 12	X	E	X	X	G	X	G	G	E	X	X	X			G	G
FREON 22	F	E		X	X	X	X	X	X	X	X	X			X	X
FUEL A (ASTM)	X		X	X		X	G	E		X					E	G
FUEL B (ASTM)	X		X	X		X	F	E		X					E	G
FUEL OIL	X	E	X	C	X	X	G	E	E	X		E	E	X	E	C
FURAN	X	E	C	X		X	X	X		X						
FURFURAL	E	E	C	X		X	X	X		X	E	E	E		X	E
FURFURAN		E	C	X		X	X	X		X		E				
FURFURYL ALCOHOL	F	E	G	X		X	X	X	E	X	E	G	E	X	G	E
GALLIC ACID	G	E	G	C		E	X	C		C		E	E	X	C	C
GALLOTANNIC ACID		E														
GAS, COAL										E		X				
GAS, HIGH OCTANE			X		E		X	G	E		X	E	C	C		
GASOLINE	X	G	X	X	E	X	X	E	E	X		E	E	G	E	E
GLACIAL ACRYLIC ACID																E
GLUCONIC ACID	F	E		G		X				X			E			E
GLUCOSE	E		G	E		E	G	G	G	E		G	E	X	E	E
GLYCERINE	E	E	E	E	E	E	E	E	E	E	X	E		X	E	C
GLYCEROL	E	E	E	E		E	E	E	E	E		E		X	E	
GLYCOGENIC ACID		E														
GLYCOLS	E	E	E	E	G	E	E	E	E	E	G	E	E	X	E	E
GLYCONIC ACID		E														

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BUTYL CPE EPDM **HYPALON** **HYTREL** **NATURAL** **NEOPRENE** **NITRILE** **NYLON** **SANTOPRENE** **SBR** **TEFLON** **UHMW** **URETHANE** **VITON** **XLPE**

CHEMICAL	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
GLYCYL ALCOHOL		E														
GREASE	X			X	X	E	X	X	E	E	X	X	E	E	E	E
GREEN SULFATE LIQUOR	E	G	E	E			E	G	G	C	E		E	E		E
HALON 1211								E	E							
HELIUM	E		E	E	G	E	E	E	E	E		G		G	E	
HEPTALDEHYDE		G														
HEPTANAL	E	G		X		X				X			E			E
HEPTANE	X	E	X	X	G	X	G	E	E	X		E	E	G	E	G
HEPTANE CARBOXYLIC ACID		E														
HEPTANOIC ACID		E														
HEPTANONE		C														
HEXADECANOIC ACID		E														
HEXALDEHYDE	G		E	C		X	E	X		X		E	E	G	X	E
HEXANE	X	G	X	X	X	X	C	C	E	X		E	G	G	E	G
HEXANOL	E	E		E		E				E					G	E
HEXENE	X	E	X	G		X	G	G		X		E			E	E
HEXYL ALCOHOL	G	E	C	C		E	G	E		E		E	E	X	G	E
HEXYL METHYL KETONE	G			X		X				X					X	E
HEXYLAMINE	E	G		F		G				G						
HEXYLENE GLYCOL	E	E		E		E				E					E	
HISTOWAX		E														
HYDRAULIC & MOTOR OIL	X	E	X	G	E	X	C	E	E	X	X	E	E	E	E	E
HYDRAZINE	E	C	X	E	G	X	G	X	E			X		X		
HYDROBROMIC ACID	E	E	E	E		E	X	X	X	X		E	G	X	C	C
HYDROCHLORIC ACID	F	E	X	X	C	E	X	X	X	X		E	E	E	C	E
HYDROCYANIC ACID	E	C	C	C	X	X	E	C	G			E	E	E		
HYDROFLUORIC ACID	E	E	X	E	X	X	X	X	X	X	X	E	E	X	G	C
HYDROFLUOSILICIC ACID	E	E	E	E	C	X	C		E			E	C	G		C
HYDROGEN CHLORIDE ANHYDROUS		E														
HYDROGEN DIOXIDE (11%)		E														
HYDROGEN GAS	E	E	E	G	E	G	E	E	E	G		E	E	E	C	E
HYDROGEN PEROXIDE OVER 10%	X	E	X	X		X	X	X	X	X		E	G		E	C
HYDROGEN PEROXIDE 10%	F	E	F	F		X	F	X	X	X		E	G		E	C
HYDROGEN SULFIDE (WET)	E	G	E	X	E	X	C	X	X	X		E	E	X	X	E
HYDROXY BENZENE		E														
HYDROXYISOBUTYRONITRILE		E														
HYDROXYTOLUENE		E														
HYVAR XL			E													
IMINODI-2-PROPANOL		E														
IMINODIETHANOL		E														
IODINE	C	E	C	E		C	X	C		C			G		C	C
IODINE PENTAFLUORIDE	X		X	X		X	X	X		X			C	X	X	
IODOFORM			X			X	X	E		X						
ISO-BUTANAL		G														
ISO-BUTYLAMINE		G														
ISO-BUTYLBROMIDE		C														
ISO-BUTYLCARBINOL		E														
ISO-OCTANE		E														

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BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFELON UHMW URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFELON	UHMW	URETHANE	VITON	XLPE
ISOCYANATES														E		E
ISOCTANE	X	G	X	X	E	X	C	E	E	X	X	E	E	E	E	E
ISOPROPYL ACETATE	G		X	X		X	X	X		X		E	E	X	X	E
ISOPROPYL ALCOHOL	E	E	E	E	E	E	C	C	E	E		E	E	X	E	E
ISOPROPYL ETHER	X		X	C		X	X	C		X		E	E	E	X	E
JET FUELS	X		X	X		X	G	E		X			E		E	E
JP-4 OIL	X		X	X	C	X	X	G	E	X	C	E		C	E	
KEROSENE	X	E	X	X	C	X	C	E	E	X	X	E	E	E	E	E
KETONES	E		E	X	C	X	X	C	E	X	X	E	E	X	X	
LACQUER SOLVENTS	X		X	X	C	X	X	X	E	X		E	G	X	X	G
LACTIC ACID-COLD	E		X	G	C	G	E	X	X	G		E	E	E	C	C
LACTIC ACID-HOT			X	C	C	X	X	X	X			E				E
LARD	X	E	X	X		X	C	E		X		E	G		C	C
LAVENDER OIL	X		X	X		X	X	G		X		E	G	X	E	G
LEAD ACETATE	G	E	E	X		E	G	G		X		E	E	X	X	E
LEAD NITRATE	E	E	E	X		E	E	E		E						
LEAD SULFATE		E	E	E			E				E		E		E	E
LIME		E	G				C	X	G			G				
LIME BLEACH	E		E	G		E	G	E		G					E	
LIME SULFUR	E		E	E		X	E	X		X		E	E		E	E
LIMONENE		G														
LINOLEIC ACID	X		X	X		X	X	G		X		E				G
LINSEED OIL	C	E	X	C	C	X	C	E	E	X		E	E	G	E	C
LIQUID PETROLEUM GAS (LPG)	X	G	X	X		X	G	E		X		E		E	E	E
LUBRICATING OILS	X	E	X	F	E	X	C	G	E	X		E		E	E	E
LYE SOLUTIONS	E	E	E	E		G	G	G		G				X	G	
M E X	G	C	E	X	C	X	X	X	E	X	X	E	E	X	X	E
MAGNESIUM ACETATE	G	E														E
MAGNESIUM CHLORIDE	G	E														E
MAGNESIUM HYDRATE	E			G		E				G			E		G	E
MAGNESIUM HYDROXIDE	E	E	E	G	C	E	G	G	X	G		E	E	G	G	E
MAGNESIUM SULFATE & SULPHITE	E	E	E	E		E	E	E	E	E		E	E		E	E
MALEIC ACID	X		X	X		X	X	X	C	X			E		E	G
MALEIC ANHYDRIDE	X		X	X		X	X	X		X					X	
MALIC ACID	X		X	G		G	C	C		C		E	E		C	C
MANGANOUS SULFATE		E														
MAPP			G				E	E		G						
MERCURY	E	E	E	E	G	E	E	E	E	E		E	E	G	E	E
MERCURY VAPORS	E		E	E		E	E	E		E					E	
MESITYL OXIDE	G	G	G	X		X	X	X		X		E	E	X		E
METHALLYL ALCOHOL	E	E		E		E				E					X	E
METHALLYL CHLORIDE		C														
METHANE CARBOXYLIC ACID		E	X				G		E			E				
METHANOIC ACID		E														
METHANOL (METHYL ALCOHOL)	E	E	E	E		E	E	E	E	E		E	E	X	E	
METHANOL (WOOD ALCOHOL)	E	E	E	E	E	E	E	E	E	E	E	E	E	E	X	E
METHOXY ETHANOL		E														
METHOXYETHOXY ETHANOL		E														
METHOXYPROPENYL BENZENE		X														

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BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMW URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
METHYLPROPYL CARBINOL		E														
METHYLPROPYL KETONE	G	G		X		X				X					X	E
MINERAL OIL	X	E	X	F	E	X	C	E	E	X	X	E	E	E	E	E
MINERAL SPIRITS	X		X	X		X	F	E		X			E		E	E
MOBILE HFA			X					E	E			E				
MOLTEN SULFUR	G			F		X				X			X		G	X
MONO-CHLOROACETIC ACID	F	E		X		G				X					C	E
MONOBUTYL ETHER	F			X		X				X					X	E
MONOCHLOROENZENE	X		X	X	C	X	X	X	G	X	X	E	G	X	E	G
MONOCHLORODIFLUOROMETHANE	F			X		X				X					X	C
MONOETHANOL AMINE	E		E	X		E	X	X		X			E	X	X	E
MONOETHYL AMINE	G			F		F				F					C	C
MONOETHYLAMINE		E										E				E
MORPHOLINE			X					X	X			E				
MOTOR OIL, 40W		E											E			
MTBE	G	X					X	X		X		G	G		X	
MURIATIC ACID	F	E	F	X		E	X	X		X			E		E	E
N-BUTANAL		G														
N-BUTYLAMINE	X	G	X	X		X	X	C		X				X	X	
N-BUTYLBENZENE	X	C		X		X				X					E	E
N-BUTYLBROMIDE	X	C		X		X				X					G	G
N-BUTYLBUTYRATE	F	C		X		X				X					X	G
N-BUTYLCARBINOL		E														
N-NONYL ALCOHOL		E														
N-OCTANE	X	E	X	X		X	G	G		X				X	E	G
N-SERV (75% XYLENE)									E			E			E	C
NA-K			X					X				X				
NAPHTHA	X	E	X		E	X	X	C	E	X	X	E	E	E	E	E
NAPHTHALENE	F	E	X	X	C	X	X	X	E	X	X	E	E	C	C	E
NAPHTHENIC ACIDS		E	X	X		X	X	G		X		E			E	
NATURAL GAS	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
NEOHXANE	X	G		X		X				X					E	E
NEON GAS	E		E	E		E	E	E	E	E	E	E		E	E	
NEU-TRI	X			X		X				X					E	E
NICKEL ACETATE	E		E	X		E	G	G		X		E	E	X	X	E
NICKEL CHLORIDE	E	E	E	E		E	G	E	X	E		E	E	C	E	E
NICKEL NITRATE	E	E	E	E		E	E			E			E		E	E
NICKEL SULFATE	E	E	E	E		E	E	E	E	E		E	E		E	E
NIETYLENE						E										
NITRIC ACID, CONC (16N)	C	X	X	G	C	X	X	X	X	X	X	E	E	X	C	G
NITRIC ACID, RED FUMING	G	X	X	X	C	X	X	X	X	X	X	E	X	X	X	X
NITRIC ACID, 10%	G		C	X	C	X	X	X	X	X	E	E	E	X	X	C
NITRIC ACID, 13N		E										E				
NITRIC ACID, 13N +5%		E										E				
NITRIC ACID, 20%	G		G	X	F	X	X	X		X		E	E		C	E
NITRIC ACID, 30%	F		C	X	X	X	X	X	X	X		G	E	C	C	E
NITRIC ACID, 30% - 70%	F		F	F		X	X	X		X			E		C	G
NITRILOTRIETHANOL		E														
NITROBENZENE	F	C	X	X	C	X	X	X	E	X	C	E	E	X	G	E

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	BUTYL	CPE	EPDM	HYALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE SBR	TEFLON	UHMW	URETHANE	VITON	XLPE	
NITROETHANE	G	E	G	G		G	C	X		G		E	E	X	X	E
NITROGEN	E	E	E	E		E	E	E	G	E		E	E	E	E	E
NITROMETHANE	G		G	C		G	C	X		C		E	E	X	X	E
NITROUS OXIDE GAS									X			E	E			
NONANOIC ACID		E														
NONANOL		E														
NUTO H			X					E	E			E				
NYVAC LIGHT			E					X	E			E				
OCTANOIC ACID		E														
OCTANOL	E	E		G		G				G		E			G	E
OCTYL ACETATE	G	C		X		X				X		E			X	E
OCTYL ALCOHOL	E	E	C	E		E	G	G		E		E	E	X	E	E
OCTYL ALDEHYDE	E	E		X		X				X					X	E
OCTYL AMINE	E	G		F		G				G					C	C
OCTYL CARBINOL	E	E		E		E				E					G	E
OCTYLENE GLYCOL	E			E		E				E					E	C
OIL-PETROLEUM	X		X	F		X	G	E		X		E			E	E
OLEIC ACID	G	E	X	X	E	X	X	C	E	X		E	E	G	G	E
OLEUM (FUMING SULFURIC ACID)	X		X	X	X	X	X	C	E	X		E	X	C	X	X
OLIVE OIL	E	G	E	F		X	E	E		X		E	G	E	E	C
ORTHO-DICHLOROBENZENE	X		X	X		X	X	X		X		G		X	E	G
ORTHO-DICHLOROBENZOL	X			X		X				X					G	G
ORTHOXYLENE	X			X		X				X					E	E
OXALIC ACID	E	E	E	X		X	X	X	X	X	E	E	E	E	C	C
OXYDIETHANOL		E														
OZONE	G	E	E	G		X	C	X	X	X		E	C	G	C	C
P-CYME	X	X	X	X		X	X	X		X		E	E	X	E	E
PAINT THINNER	X		X	X		X	X	X		X	X	E	E	X	G	
PALMITIC ACID	E	E	C	C	E	X	G	E	X	X	E	E	E	E	C	C
PAPERMAKERS ALUM	E		E	E		E	E	E		E			G		E	E
PARA-DICHLOROBENZENE	X		X	X		X	X	X		X				X	E	G
PARAFFIN WAX	X	E	X	X		X	G	E		X			E		E	X
PARALDEHYDE	E					F									X	E
PARAXYLENE	X			X		X				X					E	E
PCB												E			E	
PELARGONIC ALCOHOL	E	E		X		X				X						E
PENTACHLOROETHANE	X			X		X				X					E	E
PENTADIONE		G														
PENTAMETHYLENE		G														
PENTANE	X	E	X	F		X	G	E		X			G	X	E	G
PENTANOL		E														
PENTANONE	G	C		X		X				X					X	E
PENTASOL	E			E		E	E			E					E	E
PENTYL ACETATE		C														
PENTYL ALCOHOL		E														
PENTYL BROMIDE		C														
PENTYL CHLORIDE		C														
PENTYL ETHER		E														
PENTYLAMINE		G														

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PERCHLORIC ACID-2N	G		C	G	X	X	C	X	C	X	X	E		X	E	E
PERCHLOROETHYLENE	X	C	X	X	X	X	X	X	X	X	X	E	G	X	E	G
PERCHLOROMETHANE		C														
PETROLEUM CRUDE	X	E	X	X		X	G	E		X			E	E	E	E
PETROLEUM ETHER	X	E	X	X		X		G	E	X		E			E	E
PETROLEUM OILS	X		X	X		X	G	X	G	X		E	E		E	E
PHENBO													E	X		
PHENOL	E	E	X	X	X	X	X	X	X	X	X	E	E	X	E	E
PHENOLSULFONIC ACID	F	E		X		X				X			G		X	G
PHENYLAMINE		G														
PHENYLBROMIDE		X														
PHENYLBUTANE		C														
PHENYLCHLORIDE	X	X		X		X				X					E	E
PHENYLETHYLENE		C														
PHENYLMETHANE		C														
PHENYLMETHANOL		X														
PHENYLMETHYL ACETATE		G														
PHOSPAHTE ESTERS			E		X			X	E		E	E		X		
PHOSPHORIC ACID 10%	E	E	X	E		E	X	X	X	E		E	E		E	E
PHOSPHORIC ACID 10% - 85%	G	E	X	E		G	X	X	C	X	E	E	E	X	E	E
PHOSPHORUS TRICHLORIDE	E	X	E	X		X	X	X		X		E			E	
PICRIC ACID, H2O SOLUTION		G	X	G	C	G	C	X	X	G	X	E		X	E	
PINE OIL	X	G	X	X		X	X	X		X		E	E		E	E
PINENE	X	G	X	X		X	F	G		X		E	E	G	E	E
POLY CHLORINATED BIPHENOL												E			E	
POLYETHYLENE GLYCOL E-400	E	E		E		E				E					E	
POLYOL ESTER	X		X			X	X	G							G	
POLYPROPYLENE GLYCOL	E		E	E		E				E					E	
POTASSIUM ACETATE	G	E	E	X		X	G	G		X		E	E	X	X	E
POTASSIUM BISULFATE	E	E		E		E				E			E		E	E
POTASSIUM BISULFITE	E	E		E		E				E			E		E	E
POTASSIUM CARBONATE	E	E	E	E		E	E		G	E			E		E	E
POTASSIUM CHLORIDE	E	E	E	E		E	E	E	E	E		E	E	E	E	E
POTASSIUM CHROMATE	E	E		F									G			G
POTASSIUM CYANIDE	E	E	E	E		E	E	E	E	E		E	E	E	E	E
POTASSIUM DICHROMATE	E	E	E	F	C	G	E	E		G		E	G	G	E	G
POTASSIUM HYDRATE	E			G		E				G					F	E
POTASSIUM HYDROXIDE	E	E	E	G	G	E	C	X	C	G		E	G	C	X	E
POTASSIUM NITRATE	E	E	E	E		E	E	E	E	E		E	E	E	E	E
POTASSIUM PERMANGANATE, 5%					X								E			
POTASSIUM SILICATE	E	E		E		E				E					E	E
POTASSIUM SULFATE	E	E	E	E		E	E	E	E	E		E	E	G	E	E
POTASSIUM SULFIDE		E											E			
POTASSIUM SULFITE	E	E	E	E		E	E			E					E	E
PRESTONE ANTIFREEZE			E				E	E							E	
PRODUCER GAS	X		X	G		X	G	E		E		E			E	
PROPANE	X	E	X	G		X	C	E	E	X		E		E	E	E
PROPANEDIOL	E	E		E		E				E					E	
PROPANETRIOL		E														

CHEMICAL RESISTANCE CHART

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	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
PROPANOL	E	E		E		E				E				F	E
PROPANOLAMINE		E													
PROPANONE		E													
PROPEN-L-OL		E													
PROPENEDIAMINE		E													
PROPENENITRILE		E													
PROPENYL ALCOHOL		E													
PROPENYLANISOLE		X													
PROPIONIC ACID			E					X							E
PROPIONITRILE			X				G	E						E	
PROPYL ACETATE	G	G	G	X		X	X	X		X		E	X	X	E
PROPYL ALCOHOL	E	E	E	E		E	E	E		E		E	C	E	E
PROPYL ALDEHYDE	E					F						E		X	E
PROPYL BENZENE		C													
PROPYL CHLORIDE	F	C		X		X				X		E		G	G
PROPYL ETHER		E													
PROPYL NITRATE	G	G	G	X		X	X	X		X				X	
PROPYLENE	X	E	X	X		X	X	X		X				X	E
PROPYLENE DIAMINE	E			F		G				G					
PROPYLENE GLYCOL	E			E		E				E		E	E	E	E
PYDRAUL, 'E' SERIES		G	E	X	E	X	X	X	E	X		E	E	E	E
PYDRAULIC 'C'			X		E		X	X				E			E
QUINTOLUBRIC 822 SERIES	X		X			X	X	G							G
RED OIL	X	E	X	G		X	G	E		X		E		G	E
REFRIGERANT 11			X				X	G							G
REFRIGERANT 12			X				G	E							G
REFRIGERANT 22			X				G	X							G
RESORCINOL					X			X	X		X	E		X	
SAE NO.10 OIL				X	E		C	G	E		X	E		E	X
SAL AMMONIAC	E	E	E	E		E	E	E		E			E	E	
SEA WATER	E		E	E	E	E	G	E	E	E	E	E	E	E	E
SEWAGE	F	E	F	E		F	E	E	E	F		E	E	X	C
SILICATE ESTERS	X		X	E		X	E	G	E	X		E			E
SILICATE OF SODA	E	E	E	E		E				E					E
SILICONE GREASE	E	E	E	E	E	E	E	E		E		E			E
SILICONE OIL	E	E	E	E	E	E	E	E		E		E			E
SILVER NITRATE	E	E	E	E		E	E	G		E		E	E	E	E
SKYDROL 500 TYPE 2			E	X			X	X				E			X
SKYDROL 500B	G	G	E	X	E		X		E		E	E		C	X
SKYDROL 500C	G	G		X	E		X					E			X
SKYDROL 7000 TYPE 2			E				X	X				E			G
SOAP SOLUTIONS	E	E	E	E	E	G	G	E	E	E	E	E		C	E
SODA ASH	E	E	E	E		E	E	E	E	E		E	E		E
SODA LIME	E			G		E				G		E		F	E
SODA NITER	E	E		E		E				E				E	E
SODA, CAUSTIC	E			E		G				G		E		F	E
SODIUM ACETATE	G	E	E	X		X	G	G		X		E	E	E	X
SODIUM ALUMINATE	E	E		E		E				E		E			E
SODIUM BICARBONATE	E		E	E		E	E	E		E		E	E		E

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BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMWV URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMWV	URETHANE	VITON	XLPE
SODIUM BISULFATE	F	E	E	E		F	E	E	E	F		E	E		C	E
SODIUM BISULFITE	E	E	E	E		E	E	E	E	E		E	E		E	C
SODIUM BORATE	E	E	E	E		E	E	E	E	E		E	E		E	E
SODIUM CARBONATE 10% - 15%	E	E	E	E		E	E	E	E	E		E	E		E	E
SODIUM CHLORIDE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
SODIUM CYANIDE	E	E	E	E		E	E	E	E	E		E	E		C	E
SODIUM DICHROMATE	E	E	E	F	X	C	C	C		C			E		C	G
SODIUM HYDRATE	E			G		E				G					F	E
SODIUM HYDROCHLORITE	G		G	F		X	X	X		X					G	G
SODIUM HYDROXIDE (CAUSTIC SODA)	E	E	E	G	G	E	G	X	C	G		E	E	G	G	E
SODIUM HYPOCHLORITE	G	E	G	F	E	X	X	G	X	X	E	E	E	X	E	G
SODIUM METAPHOSPHATE	E	E	E	G		E	G	E		E		E	E		E	E
SODIUM NITRATE	E	E	E	E		E	G	G	E	E		E	E	X	C	E
SODIUM PERBORATE	E		E	G		G	G	G	E	G		E	E		E	E
SODIUM PEROXIDE	E	G	E	G	C	G	G	G	E	E		E	E	X	E	E
SODIUM PHOSPHATE	E	E	E	E		E	E	E	E	E		E	E		E	E
SODIUM SILICATE	E	E	E	E		E	E	E	E	E		E	E		E	E
SODIUM SULFATE	E	E	E	E		E	E	E	E	E		E	E		E	E
SODIUM SULFIDE	E	E	E	E		E	E	E	E	E				E	E	E
SODIUM SULFITE	E	E	E	E		E	E	E		E			E	E	E	E
SODIUM THIOSULFATE	E	E	E	E		E	E	G	E	E		E	E	E	E	E
SOYBEAN OIL	E		C	G	C	X	G	E	E	X		E	E	G	E	E
STANNIC CHLORIDE	E	E	E	E		E	X	E	E	E		E	E			E
STANNIC SULFIDE	E			E		E				E						E
STANNOUS CHLORIDE	E	E	E	E	C	E	E	E		E		E	E		C	E
STANNOUS SULFIDE	E			E		E				E						E
STEAM, BELOW 350° F	G	X	E	X	C	X	X	X	X	X		E	E	E	C	E
STEARIC ACID	G	E	G	X	C	X	G	G	E	X	E	E	E	E	E	E
STODDARD SOLVENT	X	E	X	X		X	G	E		X		E	E	E	E	E
STYRENE	X	C	X	X	X	X	X	X	E	X		E	G	E	G	G
SULFAMIC ACID	E	E	E	G		G	G	G		G					C	C
SULFUR	F		F	F		X	X	X		X		E	E		G	X
SULFUR CHLORIDE	X		X	G		X	C	C	G	X		E	E		E	E
SULFUR DIOXIDE	G		G	G	C	C	X	X	X	C		E	G		C	C
SULFUR TRIOXIDE, DRY	G	X	G	X		G	X	X	X	G		E	X		E	G
SULFURIC ACID 60% (200F)		G											X			X
SULFURIC ACID, CONC. TO 98%	X	X	X	E	C	X	X	X	X	X		C	E	X	E	E
SULFURIC ACID, FUMING	X	X	X	X	X	X	X	X		X		E	X		X	X
SULFURIC ACID, 25%	E		E	X	X	G	X	X	X	X		E	E	X	F	E
SULFURIC ACID, 25% - 50%	E	E	E	X	X	G	X	X	X	X		E	E	X	G	E
SULFURIC ACID, 50% - 96%	X		X	G	X	X	X	X	X	X		E	E	X	E	E
SULFUROUS ACID, 10%	E	E	G	E	G	E	X	X		G		E	E		C	E
SULFUROUS ACID, 10% - 85%	E	E	G	E	G	E	X	X		X		E	E		C	E
SUTAN															F	E
T-BUTYLAMINE			G	X												
TALL OIL	X		X	X		X	G	E		X			E		E	C
TALLOW	X		X	X		X	G	E		X			E		C	C
TANNIC ACID	E	E	E	E	E	E	G	E	X	F	E	E	E	E	C	C
TAR	X		X	X		X	G	X	X	X		E	X		E	X

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	BUTYL	CPE	EPDM	HYALON	HYREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
TAR BITUMINOUS	X		X	X		X	C	G		X		E			E	
TARTARIC ACID	E	E	G	E	C	C	G	E	X	X	E	E	E	C	C	C
TELONE 2																E
TERPINOL	C	E	C	X		X	X	G		X		E	G	G	E	G
TERTIARY BUTYL ALCOHOL	E	G	G	E		E	G	G		E		E		X	E	E
TERTIARY BUTYL AMINE			G	X												
TERTIARY BUTYL MERCAPTAN	X		X	X		X	X	X		X		E			E	
TETRACHLOROBENZENE	X			X		X				X					G	G
TETRACHLOROMETHANE	X	C		X		X				X					E	E
TETRACHLOROETHYLENE	X	X	X	X		X	X	X	C	X			E	X	E	E
TETRACHLORONAPHTHALENE	X			X		X				X					G	G
TETRAETHYLENE GLYCOL	E			E		E				E					E	
TETRAETHYLOORTHOSSILICATE		E			G			X								
TETRAHYDROFURAN	X	X	X	X	G	X	X		C	X	X			X	X	C
THF									C							C
TIN CHLORIDE	E			E		E		G		E			E			E
TITANIUM TETRACHLORIDE	X	X	X	X	C	X	X	X		X			G	X	E	
TOLUENE	E	X	X	X		X	X		E	X	X	E	E	X	E	G
TOLUIDINE		C														
TOLUOL		C														
TRANSFORMER OIL	X	E	X	C		X	G	E		X		E	E	E	E	
TRANSMISSION 'A' OIL	X	E	X	X		X	G	E	E	X		E		E	E	F
TRI (2-HYDROXYETHYL) AMINE		E														
TRIBUTYL PHOSPHATE	E	C	G	X		X	X	X	E	X		E	E	X	X	E
TRIBUTYLAMINE	E	E		F		G	G			G						
TRICHLOROACETIC ACID	G		G	X		C	X	G		G		E	E	X	C	E
TRICHLOROBENZENE	X	X		X		X				X					G	G
TRICHLOROETHANE	X	X	X	X		X	X	X		X		E		X	E	G
TRICHLOROETHYLENE	X	X	X	X	C	X	X	X	E	X		X	G	X	E	G
TRICHLOROMETHANE		X														
TRICHLOROTOLUENE		X														
TRICRESYL PHOSPHATE	E	E	X	X		X	X	X		X		E	E	X	G	E
TRIETHANOLAMINE	E	E	G	G	X	E	G	C		X		E	E	X	X	E
TRIETHYLAMINE	E	E		F		G				G						
TRIETHYLENE GLYCOL	E	E		E		E				E					E	
TRIHYDROXYBENZOIC ACID		E														
TRIMETHYL PENTANES (MIXED)		E														
TRIMETHYL PENTENE		E														
TRIMETHYLAMINE		E										E	E			E
TRISODIUM PHOSPHATE	E	E	E	E	E	E	E	E	E	E		E		E	E	E
TRITOYL PHOSPHATE		E														
TUNG OIL							G						E			
TUNG OIL (CHINA OIL)	C		X	C	C	X	G	E		X		E	E	C	E	E
TURPENTINEX	X	G	X	X		X	X	X	E	X	X	E	G	E	E	G
UDMH			E	E		E	G	G		E					X	
UNDECYL ALCOHOL		E														
UREA	E	E					E		E			E	E	E		E
URETHANE FORMULATIONS								E	E			E				
URIC ACID									E		E					

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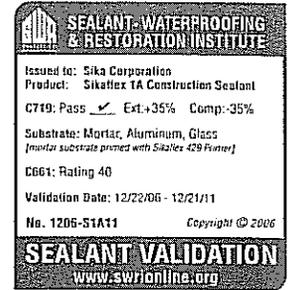
BUTYL CPE EPDM HYPALON HYTREL NATURAL NEOPRENE NITRILE NYLON SANTOPRENE SBR TEFLON UHMW URETHANE VITON XLPE

	BUTYL	CPE	EPDM	HYPALON	HYTREL	NATURAL	NEOPRENE	NITRILE	NYLON	SANTOPRENE	SBR	TEFLON	UHMW	URETHANE	VITON	XLPE
VARNISH	X		X	X	G	X	X	G	E	X		E		C	E	
VEGETABLE OILS	E	E	C	X		X	C	E		X		E	E		E	E
VERSILUBE F44								E	E			E				
VERSILUBE F55			X					E	E			E				
VINEGAR	E	G	E	F	E	E	F	X	E	F		E	X	X	C	X
VINEGAR ACID		G														
VINYL ACETATE	G	E		X		X				X			E		X	E
VINYL BENZENE	X	C		X		X				X			E		G	G
VINYL CHLORIDE	X	X	X	X		X	X	X		X		E	E		E	E
VINYL CYANIDE		E														
VINYL ETHER	G			X		X				X			E			E
VINYL STYRENE		X														
VINYL TOLUENE	X	C		X		X				X			E		E	E
VINYL TRICHLORIDE	X	G		X		X				X		E	E		E	E
VITAL, 4300, 5310			X					X	E			E				
VM&P NAPHTHA	X		X	X		X	F	E		X					E	X
WATER	E	E	E	E	E	E	G	E	E	F	E	E	E	E	E	E
WATER, BOILING			E		G		E						X			X
WATER, SODA					E				E		E	E				
WEMCO C	X		X	X		X	G	E		X				E	E	
WHISKEY	E	E	E	E		E	E	E	E	E		E	X	X	X	X
WHITE OIL	X		X	X		X	E	E		X		E	E	E	X	X
WHITE PINE OIL	X		X	X		X	X	G		X					E	
WINES	E	E	E	E		E	E	E	E	E		E	X	X	X	X
WOOD ALCOHOL	E		E	E		E	E	E		E		E	X	X	X	E
WOOD OIL	X		X	C		X	G	E		X		E	E	C	E	E
XENON	E		E	E		E	E	E		E				E	E	
XYLENE, XYLOL	X	X	X	X	C	X	X	X	E	X	X	E	E	C	E	G
XYLIDINE	X	C	G	X		C	C	C		C		E	G	X	X	G
ZEOLITES	E		E	E		E	E	E		E					E	
ZINC ACETATE	E	E	E	E		E	E	E		X		E		X	X	
ZINC CARBONATE	E			E		E				E			E		E	E
ZINC CHLORIDE	E	X	E	E	E	E	E	E	X	E		E	E	E	E	E
ZINC CHROMATE	E			F												G
ZINC SULFATE	E	X	E	E		E	E	E	E	E		E			E	E
4-HYDROXY-4-METHYL-2-PENTANONE		E														

Product Data Sheet
Edition 4.13.2009
Identification no. 431
Sikaflex-1a

Sikaflex[®]-1a

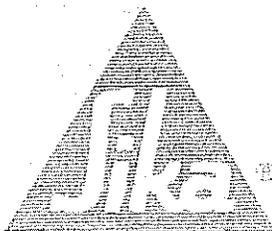
One part polyurethane,
elastomeric sealant/adhesive



Description	Sikaflex-1a is a premium-grade, high-performance, moisture-cured, 1-component, polyurethane-based, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C, Type II, Class A. Meets ASTM C-920, Type S, Grade NS, Class 35, use T, NT, O, M, G, I; Canadian standard CAN/CGSB 19.13-M87.
Where to Use	<ul style="list-style-type: none"> ■ Designed for all types of joints where maximum depth of sealant will not exceed 1/2 in. ■ Excellent for small joints and fillets, windows, door frames, reglets, flashing, common roofing detail applications, and many construction adhesive applications. ■ Suitable for vertical and horizontal joints; readily placeable at 40°F. ■ Has many applications as an elastic adhesive between materials with dissimilar coefficients of expansion. ■ Submerged conditions, such as canal and reservoir joints.
Advantages	<ul style="list-style-type: none"> ■ Eliminates time, effort, and equipment for mixing, filling cartridges, pre-heating or thawing, and cleaning of equipment. ■ Fast tack-free and final cure times. ■ High elasticity - cures to a tough, durable, flexible consistency with exceptional cut and tear-resistance. ■ Stress relaxation. ■ Excellent adhesion - bonds to most construction materials without a primer. ■ Excellent resistance to aging, weathering. ■ Proven in tough climates around the world. ■ NSF Registered, meets 1998 USDA guidelines. ■ Odorless, non-staining. ■ Jet fuel resistant. ■ NSF Certified to NSF/ANSI Standard 61 for potable water contact. ■ Urethane-based; suggested by EPA for radon reduction. ■ Paintable with water-, oil- and rubber-based paints. ■ Capable of ±35% joint movement.
Coverage	10.1 fl. oz. cartridge seals 12.4 lineal ft. of 1/2 x 1/4 in. joint. 20 fl. oz. uni-pac sausage seals 24 lineal ft. of 1/2 x 1/4 in. joint.
Packaging	Disposable 10.1 fl. oz., moisture-proof composite cartridges, 24/case; and uni-pac sausages, 20 fl. oz., 20/carton.

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

Shelf Life	10.1 fl. oz. cartridges	12 months
	20 fl. oz. uni-pac sausages	12 months
	5 gallon pail	6 months
	55 gallon drum	6 months
Storage Conditions	Store at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.	
Colors	White, colonial white, aluminum gray, limestone, black, dark bronze, capitol tan. Special architectural colors on request.	
Application Temperature	40° to 100°F. Sealant should be installed when joint is at mid-range of its anticipated movement.	
Service Range	-40° to 170°F	
Curing Rate	Tack-free time	4 hours
	Tack-free to touch	3 hours
	Final cure	4 to 7 days
Tear Strength (ASTM D-624)	55 lb./in.	
Shore A Hardness (ASTM D-2240)	21 day 40±5	
Tensile Properties (ASTM D-412)		
	21 day Tensile Stress	175 psi (1.21 MPa)
	Elongation at Break	550%
	Modulus of Elasticity	25% 35 psi (0.24 MPa)
		50% 60 psi (0.41 MPa)
		100% 85 psi (0.59 MPa)
Adhesion in Peel (TT-S-00230C, ASTM C 794)		
	Substrate Peel Strength	Adhesion Loss
	Concrete 20 lb.	0%
	Aluminum 20 lb.	0%
	Glass 20 lb.	0%
Weathering Resistance	Excellent	
Chemical Resistance	Good resistance to water, diluted acids, and diluted alkalines. Consult Technical Service for specific data.	



How to Use

Surface Preparation

Clean all surfaces. Joint walls must be sound, clean, dry, frost-free, and free of oil and grease. Curing compound residues and any other foreign matter must be thoroughly removed. Install bond breaker tape or backer rod to prevent bond at base of joint.

Priming

Priming is not usually necessary. Most substrates only require priming if testing indicates a need or where sealant will be subjected to water immersion after cure. Consult Sikaflex Primer Technical Data Sheet or Technical Service for additional information on priming.

Application

Recommended application temperatures: 40°-100°F. For cold weather application, condition units at approximately 70°F; remove prior to using. For best performance, Sikaflex-1a should be gunned into joint when joint slot is at mid-point of its designed expansion and contraction. Place nozzle of gun into bottom of the joint and fill entire joint. Keep the nozzle in the sealant, continue on with a steady flow of sealant preceding the nozzle to avoid air entrapment. Avoid overlapping of sealant to eliminate entrapment of air. Tool sealant to ensure full contact with joint walls and remove air entrapment. Joint dimension should allow for 1/4 inch minimum and 1/2 inch maximum thickness for sealant. Proper design is 2:1 width to depth ratio. For use in horizontal joints in traffic areas, the absolute minimum depth of the sealant is 1/2 in. and closed cell backer rod is recommended.

Limitations

- Allow 1-week cure at standard conditions when using Sikaflex-1a in total water immersion situations and prior to painting.
- When overcoating with water, oil and rubber based paints, compatibility and adhesion testing is essential.
- Avoid exposure to high levels of chlorine. (Maximum continuous level is 5 ppm of chlorine.)
- Maximum depth of sealant must not exceed 1/2 in.; minimum depth is 1/4 in.
- Maximum expansion and contraction should not exceed 25% of average joint width.
- Do not cure in the presence of curing silicone sealants.
- Avoid contact with alcohol and other solvent cleaners during cure.
- Do not apply when moisture-vapor-transmission condition exists from the substrate as this can cause bubbling within the sealant.
- Use opened cartridges and uni-pac sausages the same day.
- When applying sealant, avoid air-entrapment.
- Since system is moisture-cured, permit sufficient exposure to air.
- White color tends to yellow slightly when exposed to ultraviolet rays.
- Light colors can yellow if exposed to direct gas fired heating element.
- The ultimate performance of Sikaflex-1a depends on good joint design and proper application with joint surfaces properly prepared.
- The depth of sealant in horizontal joints subject to traffic is 1/2 in.
- Do not tool with detergent or soap solutions.
- Do not use in contact with bituminous/asphaltic materials.

Caution

Irritant

Keep away from open flames and high heat. Contains xylene; avoid breathing vapors. Use with adequate ventilation.

Combustible

Avoid skin and eye contact. Use of NIOSH approved organic vapor respirator, safe and chemical-resistant gloves recommended. Remove contaminated clothing and shoes.

First Aid

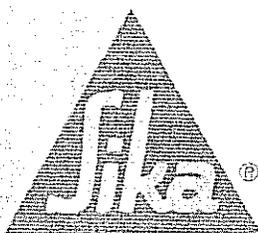
In case of skin contact, wash thoroughly with soap and water. For eye contact, flush immediately with plenty of water for at least 15 minutes; contact physician. Wash clothing before re-use. Discard contaminated shoes.

Clean Up

Uncured material can be removed with approved solvent. Cured material can only be removed mechanically. For spillage, collect, absorb, and dispose of in accordance with current, applicable local, state, and federal regulations.

Linear Feet of Sealant per Gallon

Width	Depth						
	Inches	¼	½	¾	1	1¼	1½
¼	308.0						
½	154.0	77.0					
¾	102.7	51.3	34.2				
1	77.0	38.5	25.7	19.3			
1¼	61.6	30.8	20.5	15.4	12.3		
1½	51.3	25.7	17.1	12.8	10.3	8.6	



Sikaflex-1a

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1-800-933-SIKA NATIONWIDE

Regional Information and Sales Centers. For the location of your nearest Sika sales office, contact your regional center.

Sika Corporation
 201 Polito Avenue
 Lyndhurst, NJ 07071
 Phone: 800-933-7452
 Fax: 201-933-6225

Sika Canada Inc.
 601 Delmar Avenue
 Pointe Claire
 Quebec H9R 4A9
 Phone: 514-697-2610
 Fax: 514-694-2792

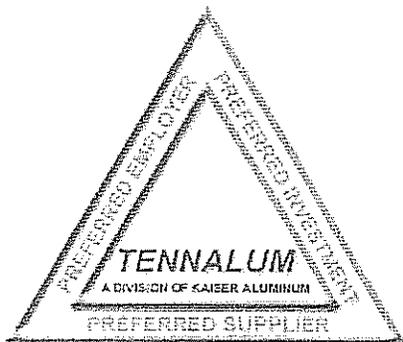
Sika Mexicana S.A. de C.V.
 Carretera Libre Celaya Km. 8.5
 Fracc. Industrial Balvanera
 Corregidora, Queretaro
 C.P. 76920
 Phone: 52 442 2385800
 Fax: 52 442 2250537



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"The Quality Producer of Aluminum Rod and Bar"

KAISER ALUMINUM TECHNICAL REFERENCE LIBRARY No. 4009

Technical Data - ALLOY 6061

Call 1-800-USE-2011

Chemical Composition Limits									Others	
Weight %	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Each	Total
Minimum	0.40	-	0.15	-	0.8	0.04	-	-	-	-
Maximum	0.8	0.7	0.40	0.15	1.2	0.35	0.25	0.15	0.05	0.15

Typical Physical Properties			
Characteristic		English	Metric
Nominal Density (68 °F/20 °C)		0.098 lbs./in. ³	2.70 Mg/m ³
Melting Range		1080 °F - 1206 °F	582 °C - 652 °C
Specific Heat (212 °F/100 °C)		0.214 BTU/lb. - °F	896 J/kg - °K
Coefficient of Thermal Expansion	Linear 68 °F-212 °F 20 °C-100 °C	13.1 micro in./in. - °F	23.6 micro m/m - °K
	Volumetric 68 °F/20 °C	3.93 x 10 ⁻⁵ in. ³ /in. ³ - °F	71 x 10 ⁻⁶ m ³ /m ³ - °K
Thermal Conductivity (68°F/20°C)	O Temper	104 BTU/ft. - hr. - °F	180 W/m - °K
	T4,T451	89 BTU/ft. - hr. - °F	154 W/m - °K
	T6,T651	97 BTU/ft. - hr. - °F	167 W/m - °K
Electrical Conductivity (68°F/20°C)	Equal Volume	O Temper	47% IACS
		T4,T451	40% IACS
		T6,T651	43% IACS
	Equal Weight	O Temper	155% IACS
		T4,T451	132% IACS
		T6,T651	142% IACS

Typical Mechanical Properties												
Temper	Tensile (.500" Dia. Specimen)					Hardness	Shear		Fatigue*		Modulus	
	Yield		Ultimate		Elongation/4D	Brinell 500kg 10 mm	Ultimate Shearing Strength		Endurance Limit R.R. Moore Type		Modulus of Elasticity	
	KSI	MPa	KSI	MPa	%		KSI	MPa	KSI	MPa	KSI x 10 ³	Gpa
O	8	55	18	124	30	30	12	83	9	62	10.0	68.3

All Aluminum Components used are type Alloy 6061-T6

T4, T451	21	145	35	241	25	65	24	165	14	97	10.0	68.3
T6, T651	40	276	45	310	17	95	30	207	14	97	10.0	68.3

*5 x 10E8 cycles of reversed stress

Comparative Characteristics

Temper	Corrosion Resistance		Cold Workability ³	Machinability ³	Anodize Response ³	Brazeability ⁴	Weldability ⁴		
	General ¹	Stress ²					Gas	Arc	Spot
O	B	A	A	D	A	A	A	A	B
T4, T451	B	B	B	C	A	A	A	A	A
T6, T651	B	A	C	C	A	A	A	A	A

1 Ratings A through E are relative ratings in decreasing order of merit, based on exposures to sodium chloride solution by intermittent spraying or immersion. Alloys with A and B ratings can be used in industrial and seacoast atmospheres without protection. Alloys with C, D and E ratings generally should be protected at least on faying surfaces.

2 Stress-corrosion cracking ratings are based on service experience and laboratory tests of specimens exposed to the 3.5% sodium chloride alternate immersion test.

A= No known instance of failure in service or in laboratory tests.

B= No known instance of failure in service; limited failures in laboratory tests of short transverse specimens.

C= Service failures with sustained tension stress acting in short transverse direction relative to grain structure; limited failures in laboratory tests of long transverse specimens.

D= Limited service failures with sustained longitudinal or long transverse

3 Ratings A through D for Workability (cold), A through E for Machinability and A through C for Anodize Response, are relative ratings in decreasing order of merit.

4 Ratings A through D for Weldability and Brazeability are relative ratings defined as follows:

A= Generally weldable by all commercial procedures and methods.

B= Weldable with special techniques or for specific applications that justify preliminary trials or testing to develop welding procedure and weld performance.

C= Limited weldability because of crack sensitivity or loss in resistance to corrosion and mechanical properties.

D= No commonly used welding methods have been developed.

Applicable Specifications	
Cold Finished	Extruded
ASTM B211	ASTM B221
QQ-A-225/8	QQ-A-200/8
AMS 4115	AMS 4150
AMS 4116	AMS 4160
AMS 4117	AMS 4161
AMS 4128	AMS 4172
	AMS 4173

Alloy Description

Generally selected where welding or brazing is required of for its high corrosion resistance in all tempers. Formability is excellent in O temper and good in the T4 temper. Machining is more difficult when compared to the other machining alloys. Corrosion resistance and appearance after anodizing are superior to all other screw machine alloys while strength is the lowest.

The Quality Producer of Aluminum Rod and Bar

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To Kaiser Aluminum

To Extruded Products Division

To Flat Rolled Products Division

Contact us: [here](#)

Phone: 1-800-USE-2011

Fax: 1-731-427-6499

TENNALUM

309 Industrial Drive

Jackson, Tennessee 38301

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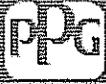
This page last updated on Tuesday March 03, 2009.

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[[Top of Page](#)]

All Aluminum Components used are type Alloy 6061-T6



HPC/Industrial Maintenance

COAL CAT® Resinous Cured Coal Tar Epoxy Coating

Generic Type

Two component, polyamide-cure type

Tinting and Base Information

Do Not Tint
97-640 Component A- Black
97-641 Component B

General Description

Intended for heavy industrial coating systems for immersion and environmental resistance to: fresh and salt water, many organic and inorganic acids, inorganic bases and salts, crude oils, petroleum and petro-chemical products, oil brines, sewage water, hydrogen sulfide liquors and fumes.

Recommended Uses

- Concrete
Galvanized Metal
Metal

Features / Benefits

- Excellent resistance to alkalines, salts, oxidizing agents and most acid dilutions
Recommended for immersion service
Perfect for tanks, pipes and structural steel in heavy industrial areas
Can earn LEED NC Version 2.2 Credits

Limitations of Use

DO NOT USE FOR POTABLE WATER. For Professional Use Only; Not Intended for Household Use. While this product will lose gloss and chalk on exterior exposure, film integrity is not adversely affected. Do not attempt to apply enough material with a single spray pass to deliver the required 6-7 mils dry per coat. Do not apply over surfaces with dew or moisture condensation on them, or when the relative humidity and ambient air temperatures are near the dew point, which might cause moisture to form. Drying times listed may vary depending on temperature, humidity, color and air movement.

Product Data

Gloss: High Gloss initially
VOC*: 1.95 lbs/gal 235.00 g/L
Coverage: 165 to 193 sq ft/gal (15 to 18 sq. m/3.78L)
Note: Does not include loss due to varying application method, surface porosity, or mixing.
DFT: 6.0 minimum to 7.0 maximum
Weight/Gallon*: 10.0 lbs. (4.5 kg) +/- 0.3 lbs. (136 g)
Volume Solids*: 72.2% +/- 2%
Weight Solids*: 80.5% +/- 2%
Mix Ratio: 4 parts Comp. A to 1 part Comp. B
Clean-up: PPG 97-725 Epoxy Thinner

Results will vary by color, thinning and other additives.
*Product data calculated on mixed product

Drying Time:

To Touch: 2 hours
To Handle: 6 hours
To Recoat: 16 hours

Dry Time @77°F (25°C); 50% relative humidity

Pot Life: 9 hours
Induction Time: 30 minutes

In Service Temperature:

Dry Heat (F): 325° Dry Heat (C): 162°
Wet Heat (F): 180° Wet Heat (C): 82°

Flash Point: 97-640 90°F, (33°C)
97-641 65°F, (18°C)

HPC/Industrial Maintenance

COAL CAT® Resinous Cured Coal Tar Epoxy Coating

General Surface Preparation

Remove all loose paint, mill scale, and rust. The surface to be coated must be dimensionally stable, dry, clean, and free of oil, grease, release agents, curing compounds, and other foreign materials. **WARNING!** If you scrape, sand, or remove old paint, you may release lead dust or fumes. **LEAD IS TOXIC. EXPOSURE TO LEAD DUST OR FUMES CAN CAUSE SERIOUS ILLNESS, SUCH AS BRAIN DAMAGE, ESPECIALLY IN CHILDREN. PREGNANT WOMEN SHOULD ALSO AVOID EXPOSURE.** Wear a properly fitted NIOSH-approved respirator and prevent skin contact to control lead exposure. Clean up carefully with a HEPA vacuum and a wet mop. Before you start, find out how to protect yourself and your family by contacting the USEPA National Lead Information Hotline at 1-800-424-LEAD or log on to www.epa.gov/lead. In Canada contact a regional Health Canada office. Follow these instructions to control exposure to other hazardous substances that may be released during surface preparation.

NON-IMMERSION SERVICE: The minimum surface preparation for substrates is SSPC-SP6 Commercial Blast cleaning, NACE Number 3. Service life of coating is in direct proportion to surface preparation.

IMMERSION SERVICE: Near White Metal Blast SSPC-SP10, NACE Number 2, is mandatory. The surface to be coated must be clean, dry, and well prepared to receive the coating.

HPC Systems in Detail Brochure (H10788) COATING SYSTEMS: 1-HD, 3-HD. For specific recommendations, see your Pittsburgh Paints dealer or call 1-800-441-9695.

Recommended Primers

none Self priming on properly prepared surfaces.

Application Information

Recommended Spread Rates:

Wet Mills :	8.3	minimum to	9.7	maximum
Wet Microns:	210.8	minimum to	246.4	maximum
Dry Mills :	6.0	minimum to	7.0	maximum
Dry Microns:	152.4	minimum to	178.0	maximum

Application Equipment: Changes in application equipment, pressures and/or tip sizes may be required depending on ambient temperatures and application conditions. Spray equipment must be handled with due care and in accordance with manufacturer's recommendation. High-pressure injection of coatings into the skin by airless equipment may cause serious injury.

Conventional Spray: Fluid Nozzle: DeVilbiss MBC-510 gun, with 704 or 777 air cap with D or E tip and needle, or comparable equipment. Atomization Pressure: 55 - 70 Fluid Pressure: Can not specify, dependent on numerous factors.

Airless Spray: Pressure 3000 psi, tip 0.017" - 0.025"

Brush: High Quality Natural Bristle Brush

Roller: Not Recommended

Thinning:

Where permitted by local VOC regulations the following thinning recommendations may be used.

Conventional Spray up to 12 oz. per gallon with 97-725 Thinner

Airless Spray up to 12 oz. per gallon with 97-725 Thinner

Brush up to 64 oz. per gallon with 97-725 Thinner

Roller not applicable

Packaging: 1-Gallon (3.78L) 5-Gallon (18.9L)

Quart (946 mL)

Not all products are available in all sizes. All containers are not full-filled.

Directions for Use

The 97-640 should be thoroughly agitated with a mechanical mixer before and during the time the curing agent, 97-641, is being added. After the two components are thoroughly mixed and blended, allow the material to digest for 30 minutes or longer before use. Explosion-proof equipment must be used when coating with these materials in confined areas. Keep containers closed and away from heat, sparks, and flames when not in use. **USE WITH ADEQUATE VENTILATION. KEEP OUT OF REACH OF CHILDREN.** Read all label and Material Safety Data Sheet (MSDS) information prior to use. MSDS are available through our website or by calling 1-800-441-9695.

Permissible temperatures during application:

Material:	50 to 90°F	10 to 32°C
Ambient:	50 to 100°F	10 to 38°C
Substrate:	50 to 100°F	10 to 38°C

PPGAF believes the technical data presented is currently accurate; however, no guarantee of accuracy, comprehensiveness, or performance is given or implied. Improvements in coatings technology may cause future technical data to vary from what is in this bulletin. For complete, up-to-date technical information, visit our web site or call 1-800-441-9695.



PPG Industries, Inc.
Architectural Coatings
One PPG Place
Pittsburgh, PA 15272
www.ppghpc.com

Technical Services
1-800-441-9695
1-888-807-5123 fax

Architect/Specifier
1-888-PPG-IDEA

PPG Architectural Finishes
400 S. 13th Street
Louisville, KY 40203

PPG Canada, Inc.
Architectural Coatings
4 Kenview Blvd
Brampton, ON L6T 5E4
F14 6/2007



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CORPORATION
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Storage Maintenance

- 1. While storing aluminum covers, be sure to place spacing blocks in between individual panels to provide adequate air flow.**
- 2. Store panels in a safe place as not to be damaged by a forklift or by any other traffic.**

Shipping & Recommended Handling Methods

Shipping Method

1. Aluminum covers are shipped via a common carrier flatbed truck.



2. All panels are palletized and double stacked on the truck.



3. All beams are banded in approximately 4' wide bundles and can be stacked on the truck.



4. Truss chords are typically nested with the components to which they will be connected with.
5. Truss diagonals and overhead bracing are typically banded with similar components.



6. Sealed wooden crates are also shipped containing any additional fasteners, plates, gaskets, isolation pads, a set of approved shop drawings, etc.



7. All shipments are also accompanied with a complete packing list describing each component on the shipment.

8. Upon delivery, the customer should review and confirm all components on the packing list are accounted for.



Recommended Handling Method:

1. While storing aluminum covers, be sure to place spacing blocks in between individual aluminum components to provide adequate air flow.



2. Store beams and panels in a safe place as not to be damaged by a forklift or by any other traffic.

Safety Precautions for Aluminum Panels

1. Take all necessary precautions to ensure that maximum loads are not exceeded.
2. When hatches are in the open position, take precautions to ensure that employees do not fall into the opening.
3. Be sure to provide adequate barriers around tank openings while aluminum panels are removed to prevent employees from falling into opening.
4. When covers are reinstalled make certain they are properly reinstalled and all fasteners and hardware are securely fastened.

INSTALLATION INSTRUCTIONS FOR ALUMINUM COVERS

1. Remove pallets of panels and beams from the truck.
2. Install ledger angle in locations as shown on shop drawings.
3. Place bearing pads under beam end.
4. Place beams in their corresponding places specified by drawing making certain the center-to-center beam spacing is correct and that the beams are parallel. (Do not anchor at this time)
5. Place the panels in their corresponding position. Making minor adjustment to beams as required for proper fit and alignment.
6. Drill bolt holes for beams into ledger angle. Figure 1
7. Secure beams with hex bolts.
8. Drill bolt holes for panels through locating groove on edge of panel into ledger angle. Figure 2
Hole spacing is one foot from each edge.
9. Secure panels with hex bolts.

Note: These installation instructions must be used with an "APPROVED" set of shop drawings. The shop drawings shall be used for locations, quantities, and sizes of material to be installed. These instructions shall be used for the proper sequence of installation for the material depicted on Hallsten Corporation's shop drawings.

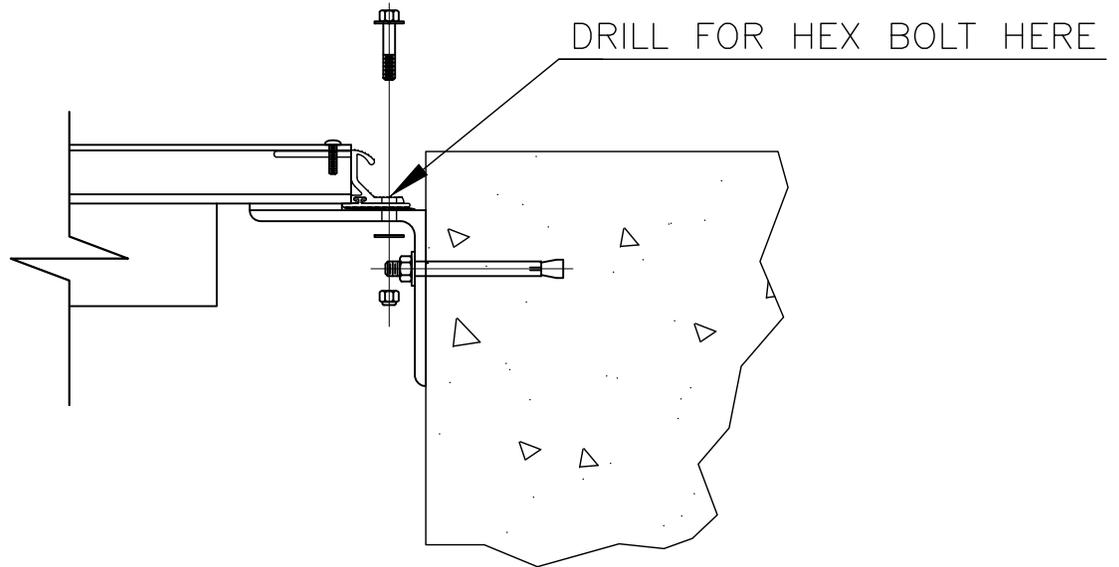


FIGURE 1

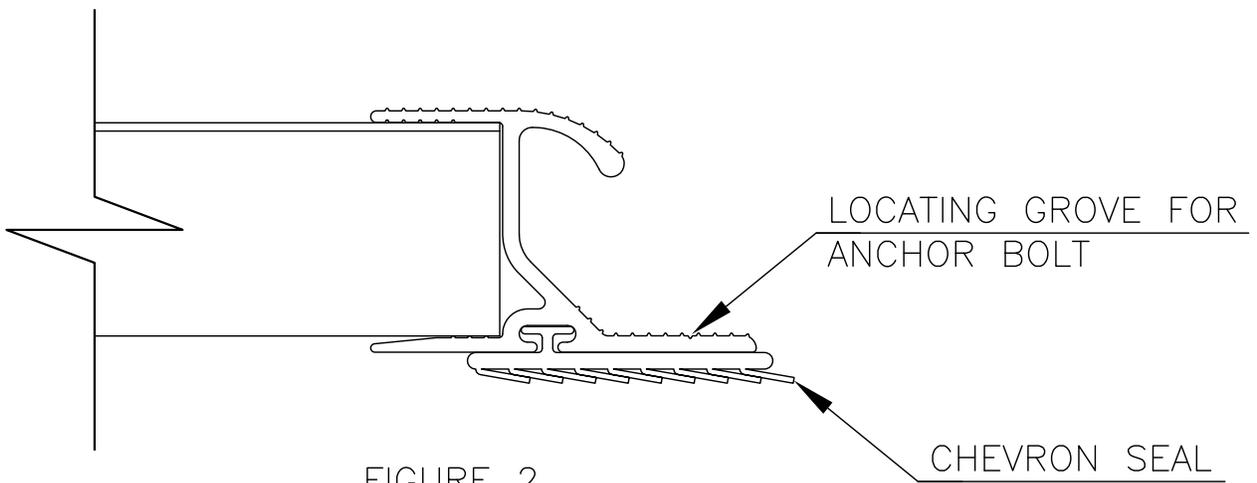
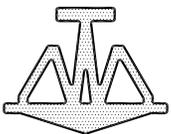
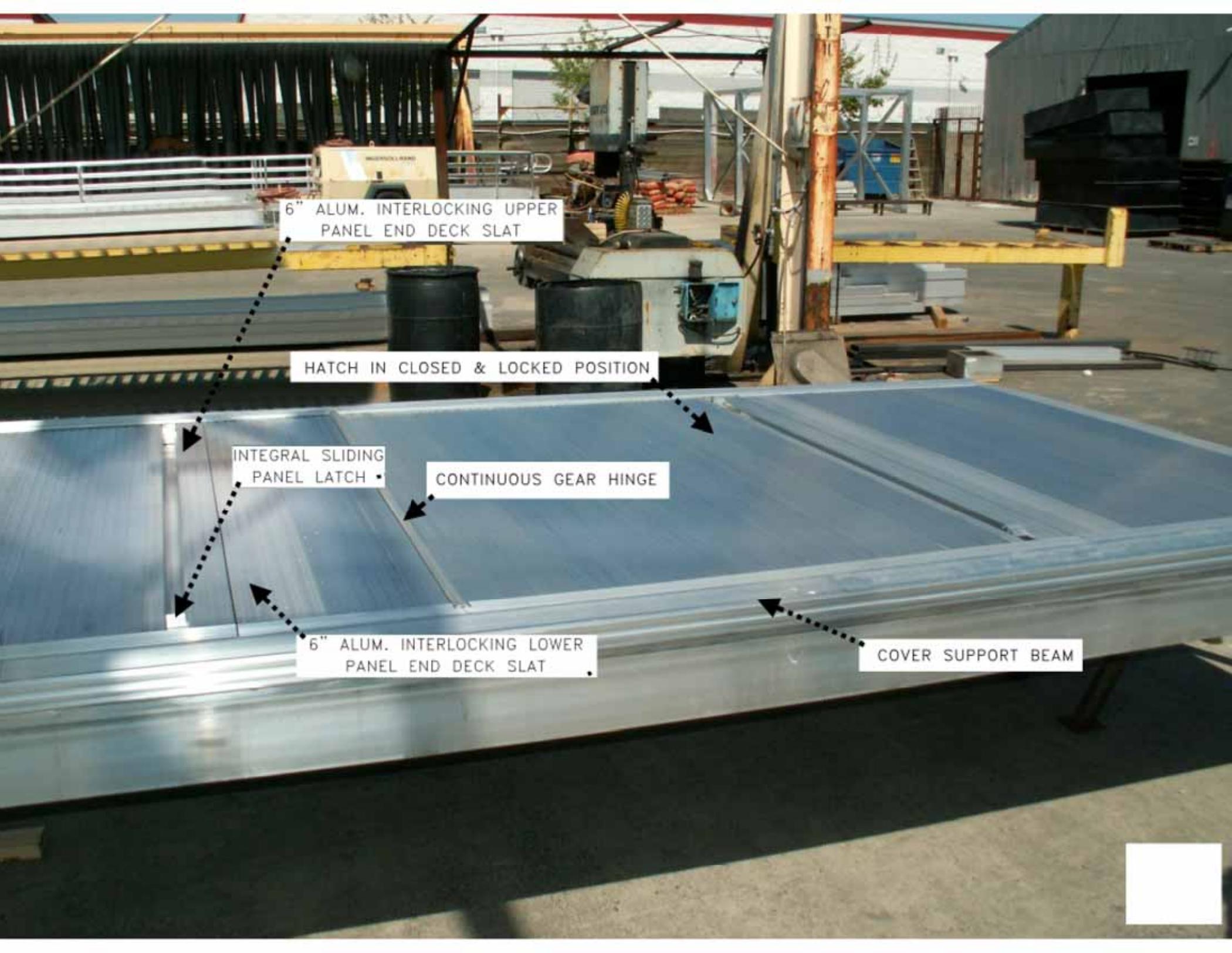


FIGURE 2



INSTALLATION INSTRUCTIONS



6" ALUM. INTERLOCKING UPPER
PANEL END DECK SLAT

HATCH IN CLOSED & LOCKED POSITION

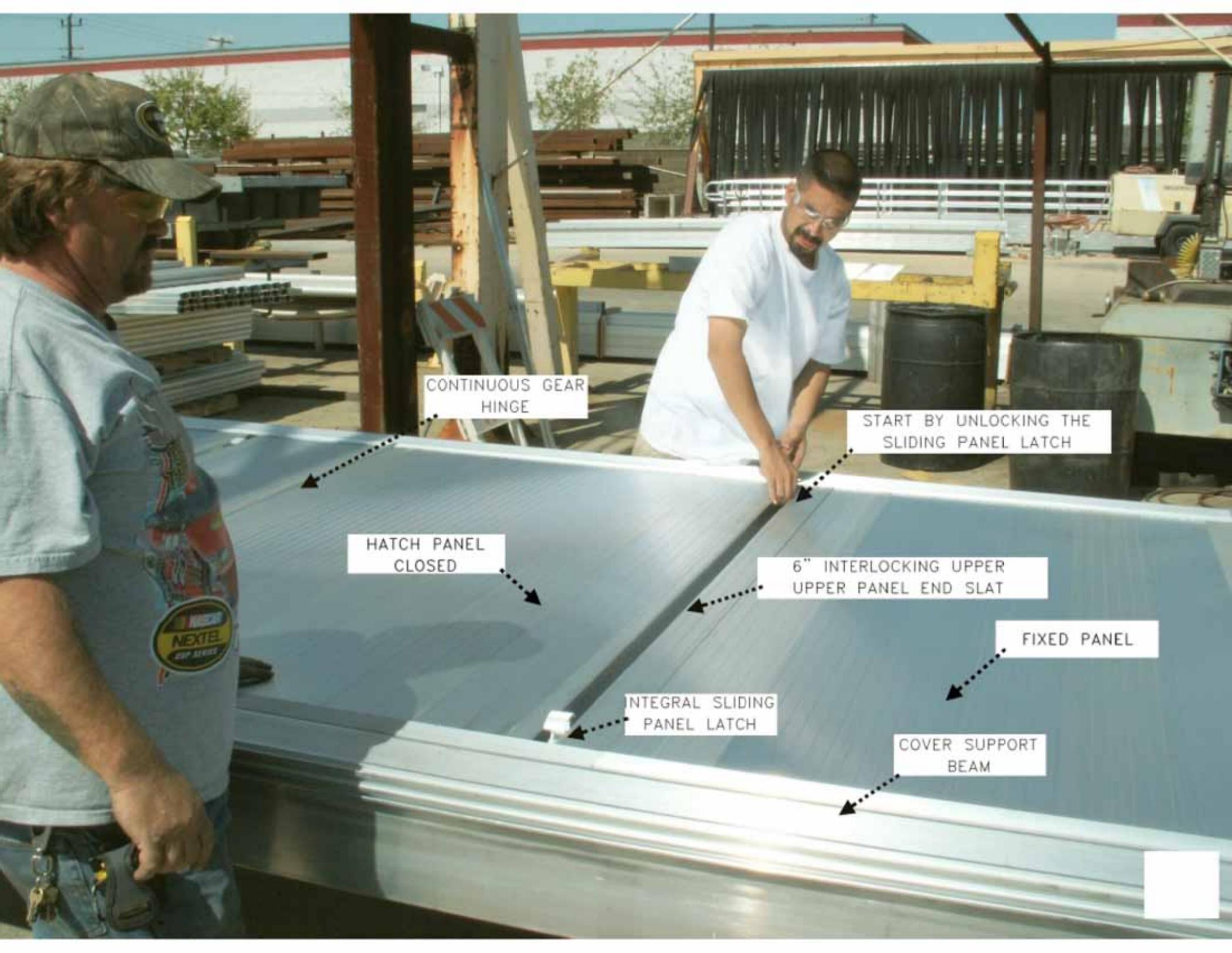
INTEGRAL SLIDING
PANEL LATCH

CONTINUOUS GEAR HINGE

6" ALUM. INTERLOCKING LOWER
PANEL END DECK SLAT

COVER SUPPORT BEAM





CONTINUOUS GEAR HINGE

START BY UNLOCKING THE SLIDING PANEL LATCH

HATCH PANEL CLOSED

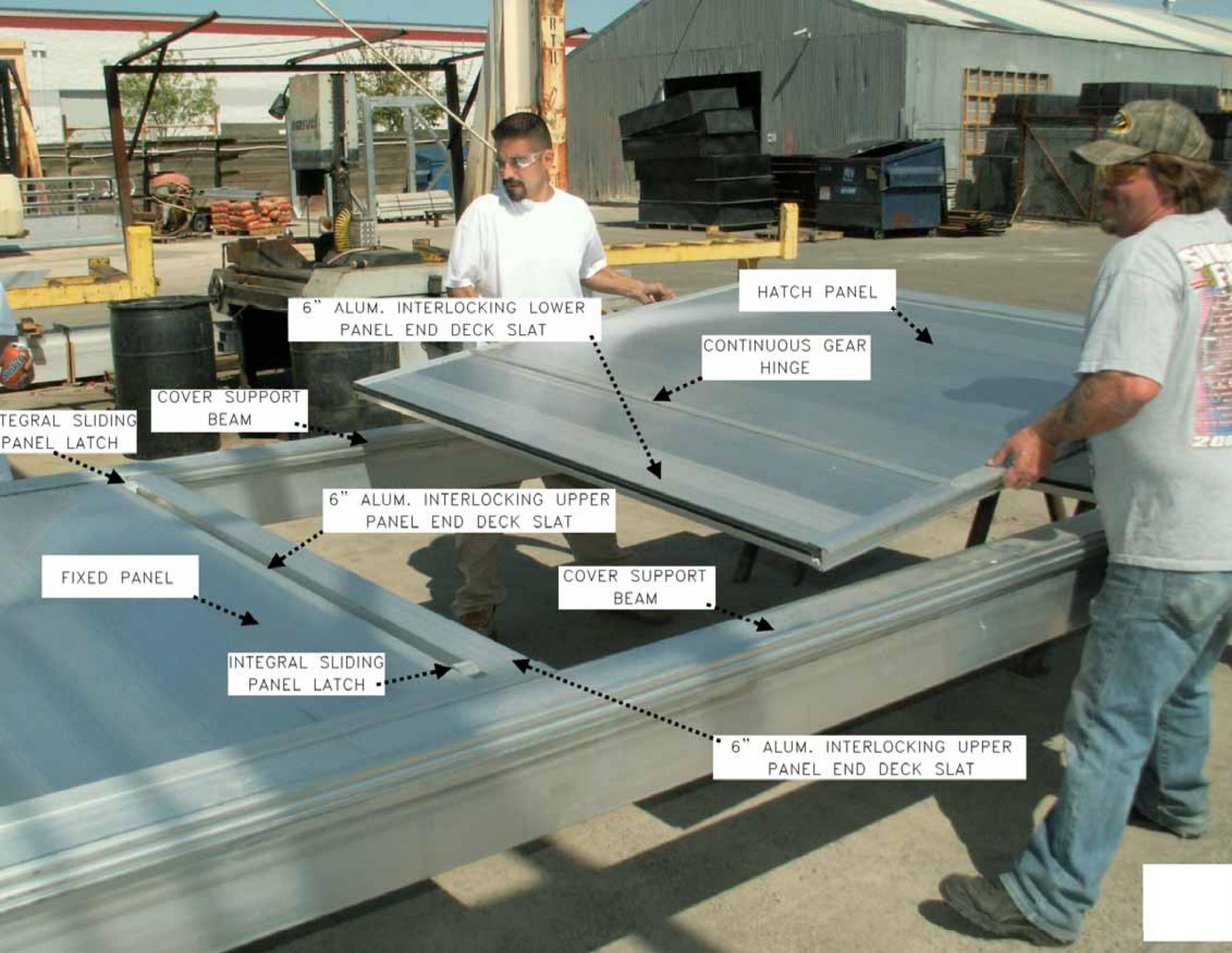
6" INTERLOCKING UPPER UPPER PANEL END SLAT

FIXED PANEL

INTEGRAL SLIDING PANEL LATCH

COVER SUPPORT BEAM





6" ALUM. INTERLOCKING LOWER
PANEL END DECK SLAT

HATCH PANEL

CONTINUOUS GEAR
HINGE

COVER SUPPORT
BEAM

INTEGRAL SLIDING
PANEL LATCH

6" ALUM. INTERLOCKING UPPER
PANEL END DECK SLAT

FIXED PANEL

COVER SUPPORT
BEAM

INTEGRAL SLIDING
PANEL LATCH

6" ALUM. INTERLOCKING UPPER
PANEL END DECK SLAT



INTEGRAL SLIDING
PANEL LATCH

6" ALUM. INTERLOCKING UPPER
PANEL END DECK SLAT

HATCH PANEL

CONTINUOUS GEAR
HINGE

FIXED PANEL

6" ALUM. INTERLOCKING UPPER
PANEL END DECK SLAT

INTEGRAL SLIDING
PANEL LATCH

COVER SUPPORT
BEAM



CONTINUOUS GEAR HINGE

START BY UNLOCKING THE SLIDING PANEL LATCH

HATCH PANEL CLOSED

6" INTERLOCKING UPPER UPPER PANEL END SLAT

FIXED PANEL

INTEGRAL SLIDING PANEL LATCH

COVER SUPPORT BEAM



HATCH PANEL ROTATES APPROX. 180 DEGREES ONTO ADJACENT FIXED PANEL

COVER SUPPORT BEAM

FIXED PANEL

COVER SUPPORT BEAM





FIXED PANEL LOCKED IN PLACE WITH INTEGRAL PANEL LATCHES

WITH DISENGAGED PANEL @ 45 DEG. ANGLE SLIDE PANEL TOWARDS OPENING



COVER SUPPORT BEAM

PANEL REMOVED

FIXED PANEL LOCKED IN PLACE WITH INTEGRAL PANEL LATCHES

COVER SUPPORT BEAM



COVER SUPPORT BEAM

PANEL REMOVED

FIXED PANEL LOCKED IN PLACE WITH INTEGRAL PANEL LATCHES

COVER SUPPORT BEAM





COVER SUPPORT BEAM

REMOVED PANEL

FIXED PANEL LOCKED IN PLACE WITH INTEGRAL PANEL LATCHES

SLIDE REMOVED PANEL TOWARDS EXISTING FIXED PANEL

COVER SUPPORT BEAM



WITH REMOVED PANEL
RE-ENGAGED WITH EXISTING
FIXED PANEL; LOWER REMOVED
PANEL INTO PLACE ONTO COVER
SUPPORT BEAMS

FIXED PANEL LOCKED IN
PLACE WITH INTEGRAL
PANEL LATCHES

COVER SUPPORT BEAM

Spare Parts List for:
City of Wenatchee Water Resource Division
For Hallsten Aluminum Covers Job# 11349

1. Twenty (20) 3/8" Epoxy-tie adhesive anchors.
2. Twenty (20) 3/8" wedge anchors.
3. Forty (40) feet of santoprene flat seal with Chevrons.
4. Forty (40) feet of panel splice seal.
5. One (1) tube of high strength anchor epoxy.
6. Two (2) tubes of Sicaflex 1-a.

Ordering Instructions:

To order any of the above spare parts, please call Hallsten Corporation's Spare parts line @ (800) 473-7440.



Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

*** Section 1 - Chemical Product and Company Identification ***

Chemical Formula: Mixture

Product Use: Various fabricated aluminum parts and products.

Other Designations: 6xxx Series Alloys, 6005A, Alclad 6061, C58, C04A, C32A, C39A, C43A (HS54), C45A, C57A, C66A, C74A, C79A, C86A, C87A, C90A, C93A, C02B, C03B, C12B, C13B, C34B, C36B, C38B, C39B, C40B, C41B, C42B, C44B, C45B, C57B, C90B, C95B, C19C, C23C, C38C, C92C, C04D, C54D, C55D, C79D, C09E, C33E, C34E, C45E, C90E, C95E, C40H, C41H, C53H, C54H, C57H, C59H, C73H, C74H, C13J, C14J, C24J, C52M, C210, C211, C243, C291, C327, C333, C336, C366, C420, C422, C444, C461, C450, C456, C491, C512, C711, C725, C733, C735, C739, C747, C750, C755, C757, C758, C761, C762, C766, C767, C769, C989, CB90, CE93, CR30, CU74, CZ19, CZ26, KB12, KB13, KB15, KB16, KB18, KB19, KB20, KB22, KB25, K661, MB376, MC61, MD64, MD244, MD248, MD257, MD265, MD284, MD290, MD293, MD294, MD326, MD337, MD342, MD343, MD344, MD361, PC61, PT61, RA35, RA271, Semi 6

Does not include Alloy 6262 (MSDS No. 390) and does not include Alloy 6020 (MSDS No. 723)

Alcoa Inc.
201 Isabella Street
Pittsburgh, PA 15212-5858

Phone: Health and Safety: 1-412-553-4649

Emergency Information: USA: Chemtrec: 1-800-424-9300 or 1-703-527-3887

Alcoa: 1-412-553-4001

Website: For a current MSDS, refer to Alcoa websites: www.alcoa.com or Internally at my.alcoa.com EHS Community

*** Section 2 - Hazards Identification ***

EMERGENCY OVERVIEW

Solid. Silvery. Odorless. Non-combustible as supplied. Small chips, fine turnings and dust from processing may be readily ignitable.

Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information):

- * Dust or fines are dispersed in the air.
- * Chips, dust or fines are in contact with water.
- * Dust or fines are in contact with certain metal oxides (e.g. rust).
- * Molten metal is in contact with water/moisture or certain metal oxides (e.g. rust).

Dust and fume from processing can cause irritation of eyes, skin and upper respiratory tract and metal fume fever.

POTENTIAL HEALTH EFFECTS

The following statements summarize the health effects generally expected in cases of overexposures. User specific situations should be assessed by a qualified individual. Additional health information can be found in Section 11.

The health effects listed below are not likely to occur unless processing of this product generates dust or fumes.

Eyes

Dust or fume from processing: Can cause irritation.

Skin

Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated contact with the skin can cause dermatitis.

Dust or fume from processing: Can cause sensitization and allergic contact dermatitis.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Inhalation

Health effects from mechanical processing (e.g., cutting, grinding): Can cause irritation of respiratory tract.

Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes), scarring of the lungs (pulmonary fibrosis), benign lung disease (stannosis), central nervous system damage, secondary Parkinson's disease and reproductive harm.

Additional health effects from elevated temperature processing (e.g., welding, melting): **Acute overexposures:** Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever) and reduced ability of the blood to carry oxygen (methemoglobin). **Chronic overexposures:** Can cause respiratory sensitization and lung cancer.

Carcinogenicity and Reproductive Hazard

Product as shipped: Does not present any cancer or reproductive hazards.

Dust and fumes from mechanical processing: Can present a cancer hazard (nickel, lead). Can present a reproductive hazard (manganese, lead).

Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (hexavalent chromium, lead compounds, nickel compounds, welding fumes). Can present a reproductive hazard (manganese, lead).

Medical Conditions Aggravated By Exposure to Product, Components or Compounds Formed During Processing

Dust or fume from processing: Asthma, chronic lung disease, skin rashes and secondary Parkinson's disease.

*** Section 3 - Composition / Information on Ingredients ***

Complete composition is provided below and may include some components classified as non-hazardous.

CAS #	Component	Percent
7429-90-5	Aluminum	>89.9
7440-66-6	Zinc	<2.5
7439-95-4	Magnesium	<2.1
7440-21-3	Silicon	<1.8
7439-96-5	Manganese	<1.5
7440-50-8	Copper	<1.3
7439-89-6	Iron	<1.1
7440-31-5	Tin*	<0.9
7440-47-3	Chromium	<0.5
7440-02-0	Nickel	0-0.30
7439-92-1	Lead**	0-0.05

Component Information

* Alloy C711 only. **Alloys C04A, C66A, C12B, C13B, C34B, C38B, C44B, C54H.

Additional compounds which may be formed during processing are listed in Section 8.

*** Section 4 - First Aid Measures ***

First Aid: Eyes

Dust or fume from processing: Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

First Aid: Skin

Dust or fume from processing or contact with lubricant/residual oil: Wash skin with soap and water for at least 15 minutes. Consult a physician if irritation persists.

First Aid: Inhalation

Dust or fume from processing: Remove to fresh air. If unconscious or severely injured, check for clear airway, breathing and presence of pulse. Perform CPR if there is no pulse or respiration. Consult a physician.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

*** Section 5 - Fire Fighting Measures ***

Flammable/Combustible Properties

This product does not present fire or explosion hazards as shipped. Small chips, turnings, dust and fines from processing may be readily ignitable.

Fire/Explosion

May be a potential hazard under the following conditions:

- * Dust or fines dispersed in the air can be explosive. Even a minor dust cloud can explode violently. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions.
- * Chips, dust or fines in contact with water can generate flammable/explosive hydrogen gas. Hydrogen gas could present an explosion hazard in confined or poorly ventilated spaces.
- * Dust or fines in contact with certain metal oxides (e.g., rust). A thermite reaction, with considerable heat generation, can be initiated by a weak ignition source.
- * Molten metal in contact with water/moisture or other metal oxides (e.g., rust, copper oxide). Moisture entrapped by molten metal can be explosive. Contact of molten aluminum with other metal oxides can initiate a thermite reaction. Finely divided metals (e.g., powders or wire) may have enough surface oxide to produce thermite reactions/explosions.

Extinguishing Media

Use Class D extinguishing agents on dusts, fines or molten metal. Use coarse water spray on chips and turnings.

Unsuitable Extinguishing Media

DO NOT USE:

- * Halogenated agents on small chips, dusts or fines.
- * Water around molten metal.

These agents will react with the burning material.

Fire Fighting Equipment/Instructions

Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

*** Section 6 - Accidental Release Measures ***

Small/Large Spill

If molten: Contain the flow using dry sand or salt flux as a dam. Do not use shovels or hand tools to halt the flow of molten aluminum. Allow the spill to cool before remelting as scrap.

*** Section 7 - Handling and Storage ***

Handling/Storage

Product should be kept dry. Avoid generating dust. Avoid contact with sharp edges or heated metal. Hot and cold aluminum are not visually different. Hot aluminum does not necessarily glow red.

Requirements for Processes Which Generate Dusts or Fumes

If processing of these products includes operations where dust or extremely fine particulate is generated, obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin F-1 and National Fire Protection Association (NFPA) brochures listed in Section 16. Cover and reseal partially empty containers. Use non-sparking handling equipment. Provide grounding and bonding where necessary to prevent accumulation of static charges during dust handling and transfer operations. (See Section 15).

Local ventilation and vacuum systems must be designed to handle explosive dusts. Dry vacuums and electrostatic precipitators must not be used. Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle fines of aluminum with fines of iron, iron oxide (rust) or other metal oxides.

Do not allow chips, fines or dust to contact water, particularly in enclosed areas.

Avoid all ignition sources. Good housekeeping practices must be maintained. Do not use compressed air to remove settled material from floors, beams or equipment.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Requirements for Remelting of Scrap Material and/or Ingot

Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off the water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations. While the products may have minimal surface roughness and internal voids, there remains the possibility of moisture contamination or entrapment. If confined, even a few drops of water can lead to violent explosions.

All tooling and containers which come in contact with molten metal must be preheated or specially coated and rust free. Molds and ladles must be preheated or oiled prior to casting. Any surfaces that may contact molten metal (e.g., concrete) should be specially coated.

Drops of molten metal in water (e.g. from plasma arc cutting), while not normally an explosion hazard, can generate enough flammable hydrogen gas to present an explosion hazard. Vigorous circulation of the water and removal of the particles minimize the hazards.

During melting operations, the following minimum guidelines should be observed:

- * Inspect all materials prior to furnace charging and completely remove surface contamination such as water, ice, snow, deposits of grease and oil or other surface contamination resulting from weather exposure, shipment, or storage.
- * Store materials in dry, heated areas with any cracks or cavities pointed downwards.
- * Preheat and dry large or heavy items such as ingot adequately before charging into a furnace containing molten metal. This is typically done by use of a drying oven or homogenizing furnace. The drying cycle should bring the internal metal temperature of the coldest item of the batch to 400°F and then hold at that temperature for 6 hours.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Engineering Controls

If dust or fumes are generated through processing: Use with adequate explosion-proof ventilation to meet the limits listed in Section 8, Exposure Guidelines.

Personal Protective Equipment

Respiratory Protection

If dust or fumes are generated through processing: Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8, Exposure Guidelines. Suggested respiratory protection: P95, P100 for lead

Eye Protection

Wear safety glasses/goggles to avoid eye contact.

Skin Protection

Wear impervious gloves to avoid repeated or prolonged skin contact with residual oils and to avoid any skin injury.

General

Personnel who handle and work with **molten metal** should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).

Sampling to establish **lead** exposures is advised where exposures to airborne particulate or fumes are possible. Consult OSHA Lead Standard 29 CFR 1910.1025 for specific health/industrial hygiene precautions and requirements to follow when handling lead compounds.

Minimize breathing **oil vapors and mist**. Remove oil contaminated clothing; launder or dry-clean before reuse. Remove oil contaminated shoes and thoroughly clean and dry before reuse. Cleanse skin thoroughly after contact, before breaks and meals, and at the end of the work period. Oil coating is readily removed from skin with waterless hand cleaners followed by a thorough washing with soap and water.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Exposure Guidelines

A: General Product Information

Alcoa recommends an Occupational Exposure Limit for **Nickel Compounds** of 0.1 mg/m³ TWA.

Alcoa recommends an Occupational Exposure Limit for **Chromium (VI) Compounds [both soluble and insoluble forms]** of 0.25 ug/m³ TWA as chromium.

Alcoa recommends Occupational Exposure Limits for **Manganese** of 0.05 mg/m³ TWA (total particulate) and 0.02 mg/m³ TWA (respirable fraction).

Alcoa recommends an Occupational Exposure Limit for **Oil Mist** of 0.5 mg/m³ TWA.

B: Component Exposure Limits

Aluminum (7429-90-5)

ACGIH 10 mg/m³ TWA (metal dust)

OSHA 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction)

Silicon (7440-21-3)

OSHA 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction)

Manganese (7439-96-5)

ACGIH 0.2 mg/m³ TWA

OSHA 5 mg/m³ Ceiling (fume)

Copper (7440-50-8)

ACGIH 0.2 mg/m³ TWA (fume); 1 mg/m³ TWA (dust and mist, as Cu)

OSHA 0.1 mg/m³ TWA (fume); 1 mg/m³ TWA (dust and mist)

Tin* (7440-31-5)

ACGIH 2 mg/m³ TWA

OSHA 2 mg/m³ TWA (as Sn, except oxides)

Chromium (7440-47-3)

ACGIH 0.5 mg/m³ TWA

OSHA 1 mg/m³ TWA

Nickel (7440-02-0)

ACGIH 1.5 mg/m³ TWA (inhalable fraction)

OSHA 1 mg/m³ TWA

Lead** (7439-92-1)

ACGIH 0.05 mg/m³ TWA

OSHA 50 µg/m³ TWA

OSHA 50 µg/m³ TWA (as Pb); 30 µg/m³ Action Level (as Pb. Poison - see 29 CFR 1910.1025)

C: Exposure Limits for Additional Compounds Which May Be Formed During Processing

Alumina (non-fibrous) (1344-28-1)

ACGIH 10 mg/m³ TWA (particulate matter containing no asbestos and <1% crystalline silica)

OSHA 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction)

Zinc oxide (1314-13-2)

ACGIH 2 mg/m³ TWA (respirable fraction)

ACGIH 10 mg/m³ STEL (respirable fraction)

OSHA 5 mg/m³ TWA (fume); 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction)

Magnesium oxide fume (1309-48-4)

ACGIH 10 mg/m³ TWA (inhalable fraction)

OSHA 15 mg/m³ TWA (total particulate)

Manganese inorganic compounds (Not Available)

ACGIH 0.2 mg/m³ TWA (as Mn) (related to Manganese compounds, inorganic)

OSHA 5 mg/m³ Ceiling (as Mn)

Iron oxide (1309-37-1)

ACGIH 5 mg/m³ TWA (respirable fraction)

OSHA 10 mg/m³ TWA

Tin oxide (1332-29-2)

ACGIH 2 mg/m³ TWA (as Sn)

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Nickel insoluble compounds (Not Available)

ACGIH 0.2 mg/m³ TWA (inhalable fraction, as Ni) (related to Nickel insoluble inorganic compounds (NOS))

OSHA 1 mg/m³ TWA (as Ni)

Chromium (II) compounds (Not Available)

OSHA 0.5 mg/m³ TWA (as Cr)

Chromium (III) compounds (Not Available)

ACGIH 0.5 mg/m³ TWA (as Cr)

OSHA 0.5 mg/m³ TWA (as Cr)

Chromium (VI) compounds- water soluble (Not Available)

ACGIH 0.05 mg/m³ TWA (as Cr)

Chromium (VI) compounds (certain water insoluble forms) (Not Available)

ACGIH 0.01 mg/m³ TWA (as Cr)

OSHA 5 µg/m³ TWA

OSHA 2.5 µg/m³ Action Level (as Cr.); 5 µg/m³ TWA (as Cr. Cancer hazard - See 29 CFR 1910.1026)

Lead, inorganic compounds (Not Available)

ACGIH 0.05 mg/m³ TWA (as Pb)

OSHA 50 µg/m³ TWA (as Pb)

OSHA 50 µg/m³ TWA (as Pb); 30 µg/m³ Action Level (as Pb. Poison - see 29 CFR 1910.1025)

Oil mist, mineral (8012-95-1)

ACGIH 5 mg/m³ TWA (sampled by method that does not collect vapor)

ACGIH 10 mg/m³ STEL

OSHA 5 mg/m³ TWA

Ozone (10028-15-6)

ACGIH 0.05 ppm TWA (heavy work); 0.08 ppm TWA (moderate work); 0.10 ppm TWA (light work); 0.20 ppm TWA (heavy, moderate or light workloads, <=2 hours)

OSHA 0.1 ppm TWA; 0.2 mg/m³ TWA

Nitrogen dioxide (10102-44-0)

ACGIH 3 ppm TWA

ACGIH 5 ppm STEL

OSHA 5 ppm Ceiling; 9 mg/m³ Ceiling

Nitric oxide (10102-43-9)

ACGIH 25 ppm TWA

OSHA 25 ppm TWA; 30 mg/m³ TWA

*** Section 9 - Physical & Chemical Properties ***

Physical State: Solid: sheet, plate, wire, rod, bar, extrusion, forgings, etc.

Appearance: Silvery

Boiling Point: Not applicable

Melting Point: Range: generally 1030-1210°F (554-654°C)

Vapor Pressure: Not applicable

Vapor Density: Not applicable

Solubility in Water: None

Specific Gravity: See Density

Density: Range: generally 2.69-2.72 g/cm³ (0.097-0.099 lb/in³)

pH Level: Not applicable

Odor: None

Odor Threshold: Not applicable

Octanol-Water Coefficient: Not applicable

*** Section 10 - Chemical Stability & Reactivity Information ***

Stability

Stable under normal conditions of use, storage, and transportation as shipped.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Conditions to Avoid

Chips, fines, dust and molten metal are considerably more reactive with the following:

- * **Water:** Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped.
- * **Heat:** Oxidizes at a rate dependent upon temperature and particle size.
- * **Strong oxidizers:** Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) particularly when heated or molten.
- * **Acids and alkalis:** Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
- * **Halogenated compounds:** Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided aluminum.
- * **Iron oxide (rust) and other metal oxides (e.g., copper and lead oxides):** A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. Molten aluminum can react violently with iron oxide without external ignition source.
- * **Iron powder and water:** An explosive reaction forming hydrogen gas occurs when heated above 1470°F (800°C).

Thermite explosions have been reported when aluminum alloys were melted in furnaces used for alloying with lead, bismuth or other metals with low melting temperatures. These metals, when added as high purity ingots, can seep through cracks in furnace liners and become oxidized. During subsequent melts in the furnace, molten aluminum can contact these metal oxides resulting in a thermite explosion.

*** Section 11 - Toxicological Information ***

Health Effects Associated with Individual Ingredients

Lead dust or fume Can cause irritation of eyes and upper respiratory tract. Acute overexposures: Can cause nausea and muscle cramps. Chronic overexposures: Can cause weakness in the extremities (peripheral neuropathy), abdominal cramps and other gastrointestinal tract effects, kidney damage, liver damage, central nervous system damage, damage to blood forming organs, blood cell damage and reproductive harm. Can cause reduced fertility and fetal toxicity in pregnant women. IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Nickel dust and fumes Can cause irritation of eyes, skin and respiratory tract. Eye contact: Can cause inflammation of the eyes and eyelids (conjunctivitis). Skin contact: Can cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause perforation of the nasal septum, inflammation of the nasal passages (sinusitis), respiratory sensitization, asthma and scarring of the lungs (pulmonary fibrosis). **Nickel alloys** IARC/NTP: Reviewed but not recommended for listing by the NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Chromium dust and mist Can cause irritation of eyes, skin and respiratory tract. **Chromium and trivalent chromium** IARC/NTP: Not classified by IARC.

Copper dust and mists Can cause irritation of eyes, mucous membranes, skin and respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes) and hair discoloration.

Manganese dust or fumes Chronic overexposures: Can cause inflammation of the lung tissue, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease and reproductive harm in males.

Silicon, inert dusts Chronic overexposures: Can cause chronic bronchitis and narrowing of the airways.

Tin (dust and fume) Chronic overexposures: Can cause benign lung disease (stannosis).

Material Safety Data Sheet

Product Name: **WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS**

ID: 668

Aluminum dust, fines and fumes Low health risk by inhalation. Generally considered to be biologically inert (milling, cutting, grinding).

Some products are supplied with a lubricant/oil coating or have residual oil from the manufacturing process. **Oil** Can cause irritation of skin. Skin contact (prolonged or repeated): Can cause dermatitis.

Health Effects Associated with Individual Compounds Formed During Processing

(The following could be expected if welded, remelted or otherwise processed at elevated temperatures.)

Hexavalent chromium (Chrome VI) Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause irritant dermatitis, allergic reactions and skin ulcers. Chronic overexposures: Can cause perforation of the nasal septum, respiratory sensitization, asthma, the accumulation of fluid in the lungs (pulmonary edema), lung damage, kidney damage, lung cancer, nasal cancer and cancer of the gastrointestinal tract. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1)*.

Nickel compounds Associated with lung cancer, cancer of the vocal cords and nasal cancer. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1)*.

Magnesium oxide fumes Can cause irritation of eyes and respiratory tract. Acute overexposures: Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever).

Manganese oxide fumes Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever).

Copper fume Can cause irritation of eyes, mucous membranes and respiratory tract. Acute overexposures: Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever).

Zinc oxide fumes Can cause irritation of upper respiratory tract. Acute overexposures: Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever).

Iron oxide Chronic overexposures: Can cause benign lung disease (siderosis). Ingestion: Can cause irritation of gastrointestinal tract, bleeding, changes in the pH of the body fluids (metabolic acidosis) and liver damage.

Certain inorganic lead compounds: IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as probably carcinogenic to humans by IARC (Group 2A)*.

Silica, amorphous Acute overexposures: Can cause dryness of eyes, nose and upper respiratory tract.

Tin compounds (dust or fume) Can cause irritation of eyes, skin and respiratory tract.

Alumina (aluminum oxide) Low health risk by inhalation. Generally considered to be biologically inert.

If the product is heated well above ambient temperatures or machined, oil vapor or mist may be generated. **Oil vapor and mist** Can cause irritation of respiratory tract. Acute overexposures: Can cause bronchitis, headache, central nervous system effects (nausea, dizziness and loss of coordination) and drowsiness (narcosis).

Welding, plasma arc cutting, and arc spray metalizing can generate ozone. **Ozone** Can cause irritation of eyes, nose and upper respiratory tract. Acute overexposures: Can cause shortness of breath, tightness of chest, headache, cough, nausea and narrowing of airways. Effects are reversible on cessation of exposure. Acute overexposures (high concentrations): Can cause respiratory distress, respiratory tract damage, bleeding and the accumulation of fluid in the lungs (pulmonary edema). Effects can be delayed up to 1-2 hours. Additional information: Studies with experimental animals by inhalation have found genetic damage, reproductive harm, blood cell damage, lung damage and death.

Welding fumes IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Plasma arc cutting can generate oxides of nitrogen. **Oxides of nitrogen (NO and NO₂)** Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause reduced ability of the blood to carry oxygen (methemoglobin). Can cause cough, shortness of breath, the accumulation of fluid in the lungs (pulmonary edema) and death. Effects may be delayed up to 2-3 weeks. **Nitrogen dioxide (NO₂)** Chronic overexposures: Can cause scarring of the lungs (pulmonary fibrosis).

Acute Toxicity of Ingredients/Formed Compounds

A: General Product Information

No information available for product.

B: Component Analysis - LD50/LC50

Magnesium (7439-95-4)

Oral LD50 Rat: 230 mg/kg

Silicon (7440-21-3)

Oral LD50 Rat: 3160 mg/kg

Manganese (7439-96-5)

Oral LD50 Rat: 9 g/kg

Iron (7439-89-6)

Oral LD50 Rat: 984 mg/kg

Nickel (7440-02-0)

Oral LD50 Rat: >9000 mg/kg

C: Formed Compound Toxicity - LD50s/LC50s

Alumina (non-fibrous) (1344-28-1)

Oral LD50 Rat: >5000 mg/kg

Zinc oxide (1314-13-2)

Oral LD50 Rat: >5000 mg/kg

Iron oxide (1309-37-1)

Oral LD50 Rat: >10000 mg/kg

Oil mist, mineral (8012-95-1)

Oral LD50 Mouse: 22 g/kg

Ozone (10028-15-6)

Inhalation LC50 Rat: 4800 ppb/4H

Nitrogen dioxide (10102-44-0)

Inhalation LC50 Rat: 88 ppm/4H

Nitric oxide (10102-43-9)

Inhalation LC50 Rat: 1068 mg/m³/4H

Carcinogenicity of Ingredients

A: Ingredient Carcinogenicity - IARC/NTP

Component	CAS	IARC 1	IARC 2A	IARC 2B	IARC 3	IARC 4	NTP K	NTP RA
Chromium	7440-47-3	No	No	No	Yes	No	No	No
Nickel	7440-02-0	No	No	Yes	No	No	No	No
Lead**	7439-92-1	No	No	Yes	No	No	No	Yes

B: Ingredient Carcinogenicity - ACGIH

Chromium (7440-47-3)

ACGIH A4 - Not Classifiable as a Human Carcinogen

Nickel (7440-02-0)

ACGIH A5 - Not Suspected as a Human Carcinogen

Lead** (7439-92-1)

ACGIH A3 - Confirmed animal carcinogen with unknown relevance to humans

Material Safety Data Sheet

Product Name: **WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS**

ID: 668

C: Ingredient References

Chromium (7440-47-3)

IARC Monograph 49 [1990] (listed under Chromium and Chromium compounds) Supplement 7 [1987]

Nickel (7440-02-0)

IARC Monograph 49 [1990], Supplement 7 [1987]

Lead** (7439-92-1)

IARC Supplement 7 [1987], Monograph 23 [1980] (evaluated as a group)

Carcinogenicity of Compounds Formed During Processing

A: Formed Compound Carcinogenicity - IARC/NTP

Component	CAS	IARC 1	IARC 2A	IARC 2B	IARC 3	IARC 4	NTP K	NTP RA
Iron oxide	1309-37-1	No	No	No	Yes	No	No	No
Nickel compounds	Not Available	Yes	No	No	No	No	Yes	No
Chromium (III) compounds	Not Available	No	No	No	Yes	No	No	No
Chromium (VI) compounds (certain water insoluble forms)	Not Available	Yes	No	No	No	No	Yes	No
Lead, inorganic compounds (related to Lead compounds)	Not Available	No	Yes	No	No	No	No	Yes
Oil mist, mineral	8012-95-1	No	No	No	Yes	No	No	No
Welding fumes (NOC)	Not Available	No	No	Yes	No	No	No	No

B: Formed Compound Carcinogenicity - ACGIH

Alumina (non-fibrous) (1344-28-1)

ACGIH A4 - Not Classifiable as a Human Carcinogen

Magnesium oxide fume (1309-48-4)

ACGIH A4 - Not Classifiable as a Human Carcinogen

Iron oxide (1309-37-1)

ACGIH A4 - Not Classifiable as a Human Carcinogen (dust and fume)

Nickel insoluble compounds (Not Available)

ACGIH A1 - Confirmed Human Carcinogen (related to Nickel, inorganic compounds, insoluble (NOS))

Chromium (III) compounds (Not Available)

ACGIH A4 - Not Classifiable as a Human Carcinogen

Chromium (VI) compounds- water soluble (Not Available)

ACGIH A1 - Confirmed Human Carcinogen

Chromium (VI) compounds (certain water insoluble forms) (Not Available)

ACGIH A1 - Confirmed Human Carcinogen

Lead, inorganic compounds (Not Available)

ACGIH A3 - Confirmed animal carcinogen with unknown relevance to humans

Ozone (10028-15-6)

ACGIH A4 - Not Classifiable as a Human Carcinogen (heavy, moderate, or light workloads)

Nitrogen dioxide (10102-44-0)

ACGIH A4 - Not Classifiable as a Human Carcinogen

C: Formed Compound References

Iron oxide (1309-37-1)

IARC Supplement 7 [1987], Monograph 1 [1972]

Nickel compounds (Not Available)

IARC Monograph 49 [1990] (evaluated as a group)

Chromium (III) compounds (Not Available)

IARC Monograph 49 [1990] (listed under Chromium and Chromium compounds) Supplement 7 [1987]

Chromium (VI) compounds (certain water insoluble forms) (Not Available)

IARC Monograph 49 [1990] (evaluated as a group)

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Lead, inorganic compounds (Not Available)

IARC Monograph 87 in preparation

Oil mist, mineral (8012-95-1)

IARC Supplement 7 [1987], Monograph 33 [1984]

Welding fumes (NOC) (Not Available)

IARC Monograph 49 [1990]

Descriptions of IARC and NTP Classifications

IARC 1: The agent is carcinogenic to humans. There is sufficient evidence that a causal relationship existed between exposure to the agent and human cancer.

IARC 2A: The agent is probably carcinogenic to humans. Generally includes agents for which there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.

IARC 2B: The agent is possibly carcinogenic to humans. Generally includes agents for which there is limited evidence in humans and less than sufficient evidence in experimental animals.

IARC 3: The agent is not classifiable as to its carcinogenicity to humans. Generally includes agents for which there is inadequate evidence in humans and inadequate or limited evidence in experimental animals.

IARC 4: The agent is probably not carcinogenic to humans. Generally includes agents for which there is evidence suggesting lack of carcinogenicity in humans and in experimental animals.

NTP K: Known to be a human carcinogen.

NTP RA: Reasonably anticipated to be a human carcinogen.

***** Section 12 - Ecological Information *****

Ecotoxicity

A: General Product Information

No information available for product.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Zinc (7440-66-6)

96 Hr LC50 Pimephales promelas: 6.4 mg/L

96 Hr EC50 Selenastrum capricornutum: 30 µg/L

72 Hr EC50 water flea: 5 µg/L

Copper (7440-50-8)

96 Hr LC50 Pimephales promelas: 23 µg/L; 96 Hr LC50 Oncorhynchus mykiss: 13.8 µg/L; 96 Hr LC50 Lepomis macrochirus: 236 µg/L

72 Hr EC50 Scenedesmus subspicatus: 120 µg/L

96 Hr EC50 water flea: 10 µg/L; 96 Hr EC50 water flea: 200 µg/L

Iron (7439-89-6)

96 Hr LC50 Morone saxatilis: 13.6 mg/L [static]

Nickel (7440-02-0)

96 Hr LC50 Oncorhynchus mykiss: 31.7 mg/L (adult); 96 Hr LC50 Pimephales promelas: 3.1 mg/L; 96 Hr LC50 Brachydanio rerio: >100 mg/L

72 Hr EC50 freshwater algae (4 species): 0.1 mg/L; 72 Hr EC50 Selenastrum capricornutum: 0.18 mg/L

96 Hr EC50 water flea: 510 µg/L

Lead (7439-92-1)**

96 Hr LC50 Pimephales promelas: 6.5 mg/L

48 Hr EC50 water flea: 600 µg/L

Environmental Fate

No information available for product.

***** Section 13 - Disposal Considerations *****

Disposal Instructions

Reuse or recycle material whenever possible. Material may be disposed of at an industrial landfill.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

US EPA Waste Number & Descriptions

A: General Product Information

RCRA Status: Must be determined at time material is disposed. If material is disposed as waste, it must be characterized under RCRA according to 40 CFR, Part 261, or state equivalent in the U.S.

B: Component Waste Numbers

RCRA waste codes other than described under Section A may apply depending on use of product. Refer to 40 CFR 261 or state equivalent in the U.S.

*** Section 14 - Transportation Information ***

Special Transportation

	PSN #1	PSN #2	PSN #3	PSN #4
Notes:	(1)			
Proper Shipping Name:	Not regulated			
Hazard Class:	-			
UN NA Number:	-			
Packing Group:	-			
RQ:	-			
Other - Tech Name:	-			
Other - Marine Pollutant:	-			

Notes:

- (1) When "Not regulated," enter the proper freight classification, "MSDS Number," and "Product Name" on the shipping paperwork.

Canadian TDG Hazard Class & PIN:	Not regulated
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*** Section 15 - Regulatory Information ***

US Federal Regulations

A: General Product Information

All electrical equipment must be suitable for use in hazardous atmospheres involving aluminum powder in accordance with 29 CFR 1910.307. The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installation that will meet this requirement.

In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals.

B: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Aluminum (7429-90-5)

SARA 313: 1.0 % de minimis concentration (dust or fume only)

Zinc (7440-66-6)

SARA 313: 1.0 % de minimis concentration (dust or fume only)

CERCLA: 1000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches);
454 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the solid metal released is equal to or exceeds 0.004 inches)

Manganese (7439-96-5)

SARA 313: 1.0 % de minimis concentration

Copper (7440-50-8)

SARA 313: 1.0 % de minimis concentration

CERCLA: 5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches);
2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches)

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

Chromium (7440-47-3)

CERCLA: 5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches);
2270 kg final RQ (no reporting of releases of this hazardous material is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches)

Nickel (7440-02-0)

SARA 313: 0.1 % de minimis concentration

CERCLA: 100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches);
45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches)

Lead** (7439-92-1)

CERCLA: 10 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches);
4.54 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 0.004 inches)

SARA 311/312 Physical and Health Hazard Categories:

Immediate (acute) Health Hazard: Yes, if particulates/fumes generated during processing.

Delayed (chronic) Health Hazard: Yes, if particulates/fumes generated during processing.

Fire Hazard: No

Sudden Release of Pressure: No

Reactive: Yes, if molten

State Regulations

A: General Product Information

PENNSYLVANIA "Special Hazardous Substance": Chromium, Chromium compounds, hexavalent; Mineral oils, Nickel.

Chemical(s) known to the State of California to cause cancer: Chromium (hexavalent compounds), Lead and lead compounds, Nickel (metallic) and certain nickel compounds.

Chemical(s) known to the State of California to cause reproductive toxicity: Lead.

B: Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS #	CA	FL	MA	MN	NJ	PA
Aluminum	7429-90-5	Yes	No	Yes	Yes	Yes	Yes
Zinc	7440-66-6	Yes	No	Yes	No	Yes	Yes
Magnesium	7439-95-4	Yes	No	Yes	No	Yes	Yes
Silicon	7440-21-3	No	No	Yes	Yes	Yes	Yes
Manganese	7439-96-5	Yes	No	Yes	Yes	Yes	Yes
Copper	7440-50-8	Yes	No	Yes	Yes	Yes	Yes
Iron	7439-89-6	Yes	No	No	No	No	No
Tin*	7440-31-5	Yes	No	Yes	Yes	Yes	Yes
Chromium	7440-47-3	Yes	No	Yes	Yes	Yes	Yes
Nickel	7440-02-0	Yes	No	Yes	Yes	Yes	Yes
Lead**	7439-92-1	Yes	No	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Other Regulations

A: General Product Information

Material meets the criteria for inclusion in WHMIS Class D2A

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

B: Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Aluminum	7429-90-5	1 %
Manganese	7439-96-5	1 %
Copper	7440-50-8	1 %
Chromium	7440-47-3	0.1 %
Nickel	7440-02-0	0.1 %

C: Component Analysis - Inventory

Component	CAS #	TSCA	DSL	EINECS	AUST.	MITI
Aluminum	7429-90-5	Yes	Yes	Yes	Yes	No
Zinc	7440-66-6	Yes	Yes	Yes	Yes	No
Magnesium	7439-95-4	Yes	Yes	Yes	Yes	No
Silicon	7440-21-3	Yes	Yes	Yes	Yes	No
Manganese	7439-96-5	Yes	Yes	Yes	Yes	No
Copper	7440-50-8	Yes	Yes	Yes	Yes	No
Iron	7439-89-6	Yes	Yes	Yes	Yes	No
Tin*	7440-31-5	Yes	Yes	Yes	Yes	No
Chromium	7440-47-3	Yes	Yes	Yes	Yes	No
Nickel	7440-02-0	Yes	Yes	Yes	Yes	No
Lead**	7439-92-1	Yes	Yes	Yes	Yes	Yes

Inventory information

MITI Inventory: Pure metals are not specifically listed by CAS or MITI number on the MITI Inventory. However, the class of compounds for each of these metals is listed.

*** Section 16 - Other Information ***

MSDS History

Original: March 16, 1990

Supersedes: August 14, 2003

Revised: October 25, 2006

MSDS Status

10/25/2006: Reviewed on a periodic basis in accordance with Alcoa policy.

Changes in Sections 1, 2, 3, 4, 5, 7, 8, 10, 11, 12 & 15.

08/14/2003: Reviewed on a periodic basis in accordance with Alcoa policy. Changes in Sections 1, 2, 3, 8 and 15.

Prepared By

Hazardous Materials Control Committee

Preparer: Jon N. Peace, 412-553-2293/Stephanie Williams, 412-553-1479

MSDS System Number

115823

Other Information

* Aluminum Association's Bulletin F-1, "Guidelines for Handling Aluminum Fines Generated During Various Aluminum Fabricating Operations." The Aluminum Association, 900 19th Street, N.W., Washington, DC 20006.

* Aluminum Association, "Guidelines for Handling Molten Aluminum, The Aluminum Association, 900 19th Street, N.W., Washington, DC 20006.

* NFPA 65, Standard for Processing and Finishing of Aluminum (NFPA phone: 800-344-3555)

* NFPA 651, Standard for Manufacture of Aluminum and Magnesium Powder

* NFPA 70, Standard for National Electrical Code (Electrical Equipment, Grounding and Bonding)

* NFPA 77, Standard for Static Electricity

* Guide to Occupational Exposure Values-2006, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).

* Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991, Compiled by the American Conference of Governmental Industrial Hygienists, Inc. (ACGIH).

* NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, February 2004.

Material Safety Data Sheet

Product Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

ID: 668

* Patty's Industrial Hygiene and Toxicology: Volume II: Toxicology, 4th ed., 1994, Patty, F. A.; edited by Clayton, G. D. and Clayton, F. E.: New York: John Wiley & Sons, Inc.

* expub, www.expub.com, Expert Publishing, LLC.

Key-Legend:

ACGIH	American Conference of Governmental Industrial Hygienists
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPR	Cardio-pulmonary Resuscitation
DOT	Department of Transportation
DSL	Domestic Substances List (Canada)
EC	Effective Concentration
ED	Effective Dose
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	Environmental Protection Act
IARC	International Agency for Research on Cancer
LC ₅₀	Lethal concentration (50 percent kill)
LC _{L0}	Lowest published lethal concentration
LD ₅₀	Lethal dose (50 percent kill)
LD _{L0}	Lowest published lethal dose
LFL	Lower Flammable Limit
MITI	Ministry of International Trade & Industry
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NORM	Naturally occurring radioactive materials
NTP	National Toxicology Program
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PIN	Product Identification Number
PSN	Proper Shipping Name
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TCLP	Toxic Chemicals Leachate Program
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average
UFL	Upper Flammable Limit
WHMIS	Workplace Hazardous Materials Information System
atm	atmosphere
cm	centimeter
g, gm	gram
in	inch
kg	kilogram
lb	pound
m	meter
mg	milligram
ml, ML	milliliter
mm	millimeter
mppcf	million particles per cubic foot
n.o.s.	not otherwise specified
ppb	parts per billion
ppm	parts per million
psia	pounds per square inch absolute
u	micron
ug	microgram

INFORMATION HEREIN IS GIVEN IN GOOD FAITH AS AUTHORITATIVE AND VALID; HOWEVER, NO WARRANTY, EXPRESS OR IMPLIED, CAN BE MADE.

This is the end of MSDS # 668

WROUGHT ALUMINUM PRODUCTS

6xxx SERIES ALLOYS



WARNING

Physical Hazards: Non-combustible as supplied. Small chips, fine turnings and dust may ignite readily. Explosion potential may be present when: (1) dusts or fines are dispersed in the air, (2) fines, dust or molten aluminum are in contact with certain metal oxides (e.g. rust) or (3) chips, fines, dust or molten aluminum are in contact with water or moisture.

Health Hazards: Health effects generally expected in cases of overexposures:

EYES: Dust or fume from processing: Can cause irritation.

SKIN: Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated contact with the skin can cause dermatitis. Dust or fume from processing: Can cause sensitization and allergic contact dermatitis.

INHALATION: Health effects from mechanical processing (e.g., cutting, grinding): Can cause irritation of respiratory tract. **Chronic overexposures:** Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes), scarring of the lungs (pulmonary fibrosis) benign lung disease (stannosis), central nervous system damage, secondary Parkinson's disease and reproductive harm. Additional health effects from elevated temperature processing (e.g., welding, melting): **Acute overexposures:** Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever) and reduced ability of the blood to carry oxygen. **Chronic overexposures:** Can cause respiratory sensitization and lung cancer.

WARNING: Chromium (hexavalent compounds), Lead and lead compounds and Nickel (metallic) and nickel compounds are chemicals known to the State of California to cause cancer. Lead is a chemical known to the State of California to cause developmental toxicity. (Proposition 65)

Precautions: Avoid generating dust. Use with adequate ventilation. Keep material dry. Use appropriate personal protective equipment (safety glasses/gloves) to avoid injury. Use appropriate NIOSH approved respiratory protection (P95; P100 for lead) if concentrations exceed the permissible limits.

Fire Fighting: Use Class D extinguishing agents on dusts, fines or molten metal. Use coarse water spray on chips and turnings. **DO NOT USE:** Halogenated agents on small chips, dusts or fines, water around molten metal. These agents will react with the burning material.

First Aid (dust or fume from processing): **EYES:** Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician. **SKIN:** Wash skin with soap and water for at least 15 minutes. Consult a physician if irritation persists. **INHALATION:** Remove to fresh air. If unconscious or severely injured, check for clear airway, breathing and presence of pulse. Perform CPR if there is no pulse or respiration. Consult a physician.

See Alcoa Material Safety Data Sheet No. 668 for more information about use and disposal.

Emergency Phone: (412) 553-4001.

INGREDIENTS:	CAS NUMBERS:	INGREDIENTS:	CAS NUMBERS:
Aluminum	(7429-90-5)	Iron	(7439-89-6)
Zinc	(7440-66-6)	Tin*	(7440-31-5)
Magnesium	(7439-95-4)	Chromium	(7440-47-3)
Silicon	(7440-21-3)	Nickel	(7440-02-0)
Manganese	(7439-96-5)	Lead**	(7439-92-1)
Copper	(7440-50-8)		

* Alloy C711 Only; **Alloys C04A, C66A, C12B, C13B, C34B, C38B and C44B

Alcoa Inc.

201 Isabella Street, Pittsburgh, PA 15212-5858 USA

10/06 668



SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **Stainless Steel** Grades: 16 - 6, 21 - 6 - 9, 303, 304 - 304L, 305, 309 - 309S, 310 - 310S, 316 - 316L, 317 - 317L, 321, 347 - 348, 403, 405, 410, 416, 430, 446.
 Synonyms : **None**
TW Metals Company, Inc. The Arboretum, 760 Constitution Drive, Exton PA 19341
Emergency Phone Number: Chemtrec (24 hrs) 1-800-424-9300 or Contact Your Nearest TW Metals Office

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS #	% Weight	Occupational Exposure Limits (mg / m3)	
			OSHA PEL	ACGIH TLV
Iron (Fe)	7439 - 89 -6	39-86	10 (oxide, dust & fume)	10 (oxide,dust & fume)
*Chromium (Cr)	7440 - 47 -3	10-27	1 (Cr)	0 . 5 (Cr)
*Nickel (Ni)	7440 - 02 -0	0- 22	1 . 0 (Ni)	1 . 0 (Ni)
*Manganese (Mn)	7439 - 96 -5	0 .3 - 10	5 . 0 (fume)	0 . 2 (Mn)
*Copper (Cu)	7441 - 50 -8	0 . 04 - 4 . 4	0 . 1 (fume)	0 . 2 (fume)
Molybdenum (Mo)	7439 - 98 -7	0- 4	15 (total dust)	15 (insoluble)
**Aluminum (Al)	7429 - 90 -5	0- 2	15 (total dust)	5 (welding fumes)
Calcium (Ca)	7440 - 70 -2	0- 2		
Silicon (Si)	7440 - 21 -3	0- 2	15 (dust)	10 (inhaled dust)
Columbium (Cb)	7440 - 03 -1	0- 1		
*Cobalt (Co)	7440 - 48 -4	0- 0 . 75	0 . 1 (Co)	0 . 02 (Co)
Titanium (Ti)	7440 - 32 -6	0- 0 . 7	15 (TiO2)	10 (TiO2)
Carbon (C)	7440 - 44 -0	0- 0 . 5		
Sulphur (S)	7704 - 34 -9	0 . 001 - 0 . 4	13 (SO2)	5 (SO2)
*Selenium (Se)	7482 - 49 -2	0- 0 . 4	0 . 2 (Se)	0 . 2 (Se)
*Phosphorus (P)	7723 - 14 -0	0 . 001 - 0 . 2	0 . 1 (P)	0 . 1 (P)
Tantalum (Ta)	7440 - 25 -7	0 . 01 - 1 . 1	5 (Ta)	5 (Ta)

Note: Those elements identified by an * (including red or white phosphorous) and those elements capable of generating highly toxic fumes or dusts (identified by a **) are classified as toxic by EPA in 40 CFR 372.65 and subject to reporting requirements of SARA Title III Section 313 and 40 CFR 372

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Stainless steel products in their solid state present no inhalation, ingestion or contact health hazard. However, inhaling dusts, fumes or mists which may be generated during certain manufacturing procedures (burning, melting, welding, sawing, brazing, grinding and machining) may be hazardous to your health. Dusts may also be irritating to the unprotected skin or eyes.
ACUTE EFFECTS: Excessive exposure to dusts / fumes may cause irritation of eyes, nose or throat. Inhalation of dusts / fumes may result in metal fume fever (metallic taste in mouth, dryness and irritation of throat, chills and fever).
CHRONIC EFFECTS: Prolonged inhalation of fumes or dusts may cause a variety of adverse health effects to the respiratory system, including (but not necessarily limited to) lesions of the mucous membrane, bronchitis, pneumonia and cancers fo the nasal cavity and respiratory tract.
POTENTIAL HEALTH EFFECTS/MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
 Any pre-existing chronic respiratory condition (asthma, chronic bronchitis, emphysema).
ROUTES OF ENTRY: Inhalation (dusts / fumes / mists), Contact with Skin and Eyes (dusts / mists), Ingestion (dusts).

SECTION 4 - FIRST AID MEASURES

INHALATION: Immediately remove victim to fresh air. If condition persists, consult physician.
EYE CONTACT: Immediately flush with running water to remove particulates, consult physician.
SKIN CONTACT: If irritation develops, remove clothing and wash with soap and water. If condition persists, consult physician.
INGESTION: Consult physician.
NOTE TO PHYSICIAN: None.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: Nonflammable.
SPECIAL FIRE FIGHTING INSTRUCTIONS AND EQUIPMENT: None required.
AUTOIGNITION TEMPERATURE: NA
FLAMMABLE LIMITS: Nonflammable.
EXTINGUISHING MEDIA: Use what is appropriate for surrounding fire.
HAZARDOUS COMBUSTION PRODUCTS: None.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

CLEAN UP PROCEDURES: No special procedures needed.
SPECIALIZED EQUIPMENT: None.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING: Minimize activities which may generate dusts, mists or fumes. Keep areas well ventilated. Use suitable equipment to move materials.
PRECAUTIONS TO BE TAKEN IN STORAGE: None required.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

RESPIRATORY PROTECTION: Wear NIOSH approved dust / mist / fume respirator when welding or burning this metal.
EYE/FACE PROTECTION: Face shields (welding or burning), Safety glasses (cutting or grinding).
OTHER PROTECTIVE EQUIPMENT: Use appropriate protective clothing such as welding aprons and gloves when welding or burning.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Metal VAPOR PRESSURE: NA
ODOR: Odorless BOILING POINT (C) : NA
PHYSICAL STATE: Solid SOLUBILITY IN WATER : Insoluble
VAPOR PRESSURE: NA SPECIFIC GRAVITY(H2O=1): 7 . 45 - 8 . 02

SECTION 10 - STABILITY AND REACTIVITY

STABILITY: Stable under normal storage conditions.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: None.
HAZARDOUS DECOMPOSITION PRODUCTS (when heated): None.
MATERIALS TO AVOID: Strong Acids (such as Sulfuric, Hydrochloric, Nitric).

SECTION 11 - TOXICOLOGY INFORMATION

LETHAL CONCENTRATION (LC50) : None established.
REPRODUCTIVE EFFECTS: NA
LETHAL DOSE (LD50) : NA
MUTAGENICITY: NA
TERATOGENICITY: NA
CARCINOGENIC BY NTP, IARC OR OSHA: No (Note: Fumes / dusts / mists from this material may be carcinogenic if inhaled over long periods of time).

SECTION 12 - ECOLOGICAL INFORMATION

No Adverse ecological effects are expected.

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Recycle scrap materials through scrap dealers and brokers. Dispose of used non-cyclable materials in accordance with local, state and federal regulations.

SECTION 14 - TRANSPORT INFORMATION

No special DOT regulations pertaining to this material.

SECTION 15 - REGULATORY INFORMATION

SARA: Some components of this product are classified as toxic by the EPA in 40 CFR 372 . 65 and subject to reporting requirements of SARA Title III Section 313 and 40 CFR 372 . 45

SECTION 16 - OTHER INFORMATION

OTHER PRECAUTIONS: Take appropriate precautions when moving or shipping this material to prevent injury to personnel handling it.

DISCLAIMER:

Information included in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any representation or warranty, expressed or implied regarding its accuracy or correctness. The conditions or methods of handling, storage, use and/or disposal of this product are beyond the control and knowledge of the manufacturer. Therefore, the manufacturer cannot assume responsibility for adverse events which may occur in the use and/or misuse of this product and expressly disclaims liability for loss, damage and/or expense arising out of or in any way connected with the handling, storage, use and/or disposal of this product.



MATERIAL SAFETY DATA SHEET

Sikaflex® 1A (All Colors)

HMIS

HEALTH	*2
FLAMMABILITY	1
REACTIVITY	0
PERSONAL PROTECTION	C

1. Product And Company Identification

Supplier

Sika Corporation
201 Polito Ave
Lyndhurst, NJ 07071

Company Contact: EHS Department
Telephone Number: 201-933-8800
FAX Number: 201-933-9379
Web Site: www.sikausa.com

Manufacturer

Sika Corporation
201 Polito Ave
Lyndhurst, NJ 07071

Company Contact: EHS Department
Telephone Number: 201-933-8800
FAX Number: 201-933-9379
Web Site: www.sikausa.com

Supplier Emergency Contacts & Phone Number

CHEMTREC: 800-424-9300
INTERNATIONAL: 703-527-3887

Manufacturer Emergency Contacts & Phone Number

CHEMTREC: 800-424-9300
INTERNATIONAL: 703-527-3887

Issue Date: 08/09/2007

Product Name: Sikaflex® 1A (All Colors)
CAS Number: Not Established
Chemical Family: Polyurethane
MSDS Number: 4016
Product Code: 0431543

2. Composition/Information On Ingredients

Ingredient Name	CAS Number		Percent Of Total Weight
POLYISOCYANATE PREPOLYMER	Trade Secret		
XYLENE (MIXED ISOMERS)	1330-20-7	<	4

3. Hazards Identification

Eye Hazards

Causes eye irritation.

Skin Hazards

May cause skin irritation. Prolonged and/or repeated skin contact may cause an allergic reaction/sensitization.

Ingestion Hazards

May be harmful if swallowed.

Inhalation Hazards

May cause nose, throat, and lung irritation. May cause an allergic respiratory reaction / sensitization after prolonged or repeated contact. Reports have associated repeated and prolonged exposure to some of the

MATERIAL SAFETY DATA SHEET

Sikaflex® 1A (All Colors)

3. Hazards Identification - Continued

Inhalation Hazards - Continued

chemicals in this product with permanent brain, liver, kidney, and Central Nervous System damage. Headaches and dizziness may result.

4. First Aid Measures

Eye

In case of contact, hold eyelids apart and immediately flush eyes with plenty of tepid water for at least 15 minutes. Get medical attention immediately if irritation develops and persists.

Skin

In case of contact, immediately flush skin with soap and plenty of tepid water for at least 15 minutes. Get medical attention immediately if irritation (redness, rash, blistering) develops and persists.

Ingestion

If victim is fully conscious do not induce vomiting, give one or two cups of water or milk to drink. Call a physician or a poison control center immediately.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration, seek medical attention.

5. Fire Fighting Measures

Flash Point: N/A °F

Flash Point Method: Solid per ASTM D4359

Autoignition Point: N/AV °F

Lower Explosive Limit: N/AV

Upper Explosive Limit: N/AV

Fire And Explosion Hazards

During a fire, irritating and/or toxic gases and aerosols from the decomposition/combustion products may be present.

Extinguishing Media

In case of fire, use water spray (fog) foam, dry chemical, or CO₂.

Fire Fighting Instructions

In the event of a fire, firefighters should wear full protective clothing and NIOSH-approved self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Avoid release to the environment. Use appropriate Personal Protective Equipment (PPE). Contain spill and collect with absorbent material and transfer into suitable containers. Do not flush to sewer or allow to enter waterways. Ventilate enclosed area.

7. Handling And Storage

Handling And Storage Precautions

Keep out of reach of children. Store in a cool, dry, well ventilated area. Keep containers tightly closed.

Handling Precautions

Do not smoke. Use only in well ventilated areas. Condition to 65-85F before using. Use only with ventilation sufficient to reduce potential exposures (air borne levels of dust, fumes, vapors, etc.) to below recommended exposure limits.

Storage Precautions

Do not store near excessive heat. Store in tightly closed containers and protect from moisture and foreign

MATERIAL SAFETY DATA SHEET

Sikaflex® 1A (All Colors)

7. Handling And Storage - Continued

Storage Precautions - Continued

material. Ideal storage temperature is less than 75F. If maximum storage temperature is exceeded, material may prematurely polymerize without hazard.

Work/Hygienic Practices

Wash thoroughly with soap and water after handling.

8. Exposure Controls/Personal Protection

Engineering Controls

Use of a system of local and/or general exhaust is recommended to keep employee below applicable exposure limits. Refer to the current edition of "Industrial Ventilation: A Manual of Recommended Practice" published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Eye/Face Protection

Safety glasses with side shields or goggles.

Skin Protection

Chemical-resistant gloves. Lab coat or other work clothing to prevent skin exposure (Long sleeve shirt and long pants). Launder before reuse.

Respiratory Protection

A respirator protection program that meets 29 CFR 1910.134 requirement must be followed whenever workplace conditions warrant a respirator's use. In areas where the Permissible Exposure Limits are exceeded, use a properly fitted NIOSH-approved respirator.

Other/General Protection

Wash thoroughly after handling.

Ingredient(s) - Exposure Limits

XYLENE (MIXED ISOMERS)
ACGIH TLV-STEL 150 ppm
ACGIH TLV-TWA 100 ppm
OSHA PEL-TWA 100 ppm

9. Physical And Chemical Properties

Appearance

Paste (solid) in various colors

Odor

Aromatic odor

Chemical Type: Mixture

Physical State: Solid

Melting Point: N/AV °F

Boiling Point: N/AV °F

Specific Gravity: 1.4 grams/cm³

Percent VOCs: < 4%

Packing Density: 11.5 - 12.0 pounds /gallon

Vapor Pressure: N/AV

Vapor Density: > Air

Solubility: N/AV

Evaporation Rate: Slower than ether

VOC Content: < 40 grams / liter (EPA Method 24)

MATERIAL SAFETY DATA SHEET

Sikaflex® 1A (All Colors)

10. Stability And Reactivity

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid (Stability)

Open flame

Incompatible Materials

Water, Alcohol, Amines

Hazardous Decomposition Products

Carbon Dioxide, Carbon Monoxide, and Oxides of Nitrogen, Smoke, Fumes

Conditions To Avoid (Polymerization)

None known

11. Toxicological Information

Conditions Aggravated By Exposure

Eye disease, skin disorders and allergies, chronic respiratory conditions.

12. Ecological Information

No Data Available...

13. Disposal Considerations

Dispose in accordance with applicable federal, state and local government regulations. Waste generators must determine whether a discarded material is classified as a hazardous waste. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

14. Transport Information

Proper Shipping Name

Not regulated by the USDOT.

15. Regulatory Information

U.S. Regulatory Information

All ingredients of this product are listed or are excluded from listing under the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

SARA Hazard Classes

Acute Health Hazard

Chronic Health Hazard

SARA Title III - Section 313 Supplier Notification

This product contains the following toxic chemicals that are subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

XYLENE (MIXED ISOMERS) (1330-20-7) <4 %

This information must be included on all MSDSs that are copied and distributed for this material.

Ingredient(s) - U.S. Regulatory Information

XYLENE (MIXED ISOMERS)

SARA Title III - Section 313 Form "R"/TRI Reportable Chemical

SARA - Acute Health Hazard

SARA - Chronic Health Hazard

MATERIAL SAFETY DATA SHEET

Sikaflex® 1A (All Colors)

15. Regulatory Information - Continued

Ingredient(s) - U.S. Regulatory Information - Continued

SARA - Fire Hazard

Ingredient(s) - State Regulations

XYLENE (MIXED ISOMERS)

New Jersey - Workplace Hazard

New Jersey - Environmental Hazard

New Jersey - Special Hazard

Pennsylvania - Workplace Hazard

Pennsylvania - Environmental Hazard

Massachusetts - Hazardous Substance

New York City - Hazardous Substance

16. Other Information

HMIS Rating

Health: *2

Fire: 1

Reactivity: 0

PPE: C

Revision/Preparer Information

MSDS Preparer: EHS Department

MSDS Preparer Phone Number: 201 933 8800

This MSDS Supersedes A Previous MSDS Dated: 12/11/2006

Disclaimer

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Sika Corporation

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MATERIAL SAFETY DATA SHEET

SANTOPRENE™ THERMOPLASTIC RUBBER GENERAL PURPOSE GRADES

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

ADVANCED ELASTOMER SYSTEMS, L.P.

388 South Main Street
Akron, Ohio 44311

EMERGENCY TELEPHONE NUMBERS (CHEMTREC)

In the U. S. call 1-800-424-9300
Outside the US call collect 1-703-527-3887

Product Identification:

101-55	101-73W175	201-55	201-73W175
101-55W175	101-80	201-55W175	201-80
101-64	101-87	201-64	201-87
101-64W175	103-40	201-64W175	203-40
101-73	103-50	201-73	203-50

2. COMPOSITION/INFORMATION ON INGREDIENTS

Santoprene™ thermoplastic rubber grades are proprietary products. Their composition is trade secret information of Advanced Elastomer Systems, L.P. These products are not identified by CAS number. All components of these products appear on the Inventory of Chemical Substances published by the U.S. Environmental Protection Agency or qualify for the TSCA polymer exemption under U.S. Federal Register Vol. 60, No. 60, 3/29/95. New Jersey Trade Secret Registry No.: 01122800003-5001P.

<u>Components:</u>	<u>CAS. NO.</u>	<u>Airborne Exposure Limits</u>		<u>Weight Percent</u>
		<u>OSHA PEL</u>	<u>ACGIH PEL</u>	
Thermoplastic rubber	Mixture	None established	None established	100%
Components within Polymer Matrix:				
Carbon black	1333-86-4	3.5 mg/m ³ TWA	3.5 mg/m ³	0 to 3%

Black grades contain carbon black, CAS No. 1333-86-4, within the polymer matrix. The International Agency for Research on Cancer (IARC) has determined that carbon black is possibly carcinogenic to humans (IARC Group 2B). IARC determined that there is inadequate evidence in humans but sufficient evidence in experimental animals for carcinogenicity of carbon black.

3. HAZARDS IDENTIFICATION

Emergency Overview:

HANDLE PELLETS IN ACCORDANCE WITH GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES. THESE PRACTICES INCLUDE AVOIDING UNNECESSARY EXPOSURE AND REMOVAL OF THE MATERIAL FROM EYES, SKIN AND CLOTHING.

CAUTION! PROCESSING RELEASES VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION.

Avoid breathing processing fumes or vapors.
Process using adequate ventilation.

Potential Health Effects:

INHALATION: Inhalation of fumes or vapors during processing may cause respiratory tract irritation.
EYE CONTACT: Pellets do not cause significant eye irritation.
SKIN CONTACT: Pellets do not cause significant skin irritation.

4. FIRST AID MEASURES

INHALATION: If fumes are inhaled, remove to fresh air. If breathing is difficult, get medical attention.

5. FIRE FIGHTING MEASURES

Flash (piloted) Ignition Temperature: >650°F (343°C) Method: ASTM D 1929-77
Self-Ignition (non-piloted) Temperature: >700°F (371°C) Method: ASTM D 1929-77

Extinguishing Media: Water spray or any Class A extinguishing agent.

MATERIAL SAFETY DATA SHEET

SANTOPRENE™ THERMOPLASTIC RUBBER GENERAL PURPOSE GRADES

Special Firefighting Procedures: Firefighters and others exposed to products of combustion should wear self-contained breathing apparatus and full protective clothing. Carbon monoxide is liberated as a toxic decomposition product when Santoprene™ general purpose thermoplastic rubber is ignited.

Unusual Fire and Explosion Hazards: None known.

Static Generation: Pneumatic transfer of plastic pellets can generate large static discharges which could cause an incendiary electrostatic spark. Excessive transfer also causes dust which can be ignited under some conditions. Take proper precautions when transferring Santoprene™ thermoplastic rubber, including grounding all equipment, providing an inert atmosphere and properly designing material handling equipment, to prevent electrostatic charge formation.

6. ACCIDENTAL RELEASE MEASURES

Spilled product may cause a slipping hazard.

IN CASE OF SPILL OR LEAK, vacuum or sweep up and place in clean, covered containers for recycle or disposal.

7. HANDLING AND STORAGE

Avoid leaving container open for prolonged periods to prevent exposure to humidity. Santoprene™ general purpose thermoplastic rubber will pick up small amounts of moisture. Store in a cool, dry place. Usual precautions in pellet handling should be observed to prevent contamination by dirt or other materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection: Santoprene™ general purpose thermoplastic rubber does not cause significant eye irritation or eye toxicity requiring special protection. Use good industrial practice to avoid eye contact.

Skin Protection: Although Santoprene™ general purpose thermoplastic rubber does not present significant skin concern; minimize skin contamination by following good industrial hygiene practice. Wearing protective gloves is recommended. Wash hands and contaminated skin thoroughly after handling.

Respiratory Protection: Avoid breathing process vapors or dust. Use NIOSH approved respiratory protection equipment (full facepiece recommended) when airborne exposure is excessive. Consult respirator manufacturer to determine appropriate type equipment for given application. Observe respirator use limitations specified by NIOSH or the manufacturer. Respiratory protection programs must comply with 29 CFR 1910.134.

Ventilation: Provide natural or mechanical ventilation to minimize exposure. If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Black or natural (colorable) pellets.

Odor: Slightly rubberlike.

Specific Gravity: 0.95 to 0.98

Hardness: 55 Shore A to 50 Shore D

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Stability: Thermally stable to 500°F (260°C).

Materials to Avoid: Santoprene™ thermoplastic rubber may react with strong oxidizing chemicals. Santoprene™ thermoplastic rubber also reacts with acetal resins at temperatures of 425°F (218°C) and above, producing decomposition of the acetal resin, and formaldehyde as a decomposition product. Decomposition of halogenated polymers and phenolic resins may also be accelerated when they are in contact with Santo-

MATERIAL SAFETY DATA SHEET

SANTOPRENE™ THERMOPLASTIC RUBBER GENERAL PURPOSE GRADES

prene™ thermoplastic rubber at processing temperatures. Thoroughly purge processing equipment with polyolefin polymers, including polypropylene, when using the same equipment to process Santoprene™ thermoplastic rubber and acetal resins, halogenated polymers and phenolic resins. Do not mix Santoprene™ thermoplastic rubber, acetal resins, halogenated polymers or phenolic resins at elevated temperatures.

Hazardous Decomposition Products: Smoke, carbon monoxide and possibly hydrocarbons may evolve when processing temperatures exceed 500°F (260°C) or when Santoprene™ general purpose thermoplastic rubber is ignited.

Hazardous Polymerization: Does not occur.

11. TOXICOLOGICAL INFORMATION

The following information summarizes human experience and results of scientific investigations reviewed by health professionals for hazard evaluation of Santoprene™ general purpose thermoplastic rubber and development of Precautionary Measures and Occupational Control Procedures recommended in this document.

Effects of Exposure

Skin contact is expected to be the primary route of occupational exposure to Santoprene™ general purpose thermoplastic rubber. Occupational exposure to this material in normal handling and storage has not been reported to cause significant adverse human health effects. Due to its chemical and physical properties, Santoprene™ general purpose thermoplastic rubber does not appear to possess any toxicological properties which would require special handling other than the good industrial hygiene and safety practices employed with any industrial material of this type.

However, under normal processing conditions, this product will release fumes and vapors. Components of these releases may vary with processing times and temperatures and therefore specific composition cannot be predicted based on current information. These process releases may produce respiratory tract irritation where such releases are allowed to build up due to inadequate ventilation in the general work area. These fumes and vapors, with repeated and prolonged exposure at high concentrations, could cause nausea, drowsiness and headache, especially if such exposures exceed current exposure limits (where established). Good industrial hygiene and safety practices should be used to avoid unnecessary exposures.

Toxicological Data

Results of single exposure (acute) animal studies conducted on a representative grade of general purpose thermoplastic rubber indicate that these materials are practically nontoxic orally (rats) and after skin application (rabbits). They are practically nonirritating to rabbit eyes and skin.

12. ECOLOGICAL INFORMATION

No data available.

13. DISPOSAL CONSIDERATIONS

When discarded, Santoprene™ general purpose thermoplastic rubber is not a "hazardous waste" as that term is defined in 40 CFR 261, "Identification and Listing of Hazardous Waste." Recycle or burn in an approved incinerator or dispose of in an approved chemical landfill in accordance with all applicable local, state and federal laws and regulations. Consult your attorney or appropriate regulatory officials for information on such disposal. Reprocess only uncontaminated material.

Spill or Leakage Procedures: Vacuum or sweep up and place in container for recycle or disposal as recommended above.

Containers: Recycle or burn in an approved incinerator or dispose of in an approved chemical landfill in accordance with all applicable local, state and federal laws and regulations.

14. TRANSPORT INFORMATION

DOT Proper Shipping Name: Not Applicable

DOT Hazard Class/I.D. No.: Not Applicable

DOT Label: Not Applicable



MATERIAL SAFETY DATA SHEET
SANTOPRENE™ THERMOPLASTIC RUBBER GENERAL PURPOSE GRADES

U.S. Surface Freight Classification -
Rail: Rubber, Synthetic Crude

Truck: Rubber, Crude

15. REGULATORY INFORMATION

Reportable Quantity (RQ) Under
DOT (49 CFR) and CERCLA Regulations: Not Applicable

SARA Hazard Notification

Hazard Categories under criteria of
SARA Title III rules (40 CFR Part 370): Not Applicable

Section 313 Hazardous Chemical(s): Not applicable.

**SECTION 313 INFORMATION MUST BE INCLUDED IN ALL MSDSs
THAT ARE COPIED AND DISTRIBUTED FOR THIS MATERIAL.**

Hazardous Chemical(s) under OSHA Hazard Communication Standard:

Black grades contain Carbon Black 0 to 3% Weight Range

HMIS Rating: Reactivity: 1 Health: 1 Flammability: 1

16. OTHER INFORMATION

Date MSDS Initially Prepared: 5/5/95

Revision(s): 09/30/96 - Updated carbon black information

10/11/96 - Updated polymer exemption information

12/01/98 - Reviewed for accuracy. No changes made.

04/23/99 - Updated grade numbers.

07/01/99 - Removed 201-64-W171

01/19/01 - Reviewed for accuracy

08/01/01 - Addition of 101-55W237 (formally on a separate MSDS)

09/07/01 - Reviewed for accuracy

03/08/04 – Added grade TPE-80-DF

10/01/04 – Reviewed for accuracy

06/28/05 – Reviewed and updated for accuracy

07/22/08 – Removed obsolete grades (101-55W237 and 201-87W226); reviewed and updated for accuracy.

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

Product Safety
(330) 849-5163

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Material Safety Data Sheet



Date of issue 21 November 2009

Version 8

1. Product and company identification

Product name : RES COAL CAT COMP B
Code : 97-641
Supplier : PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272
Emergency telephone number : (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
Technical Phone Number : (412) 492-5200 (ALLISON PARK, PA) 8:00 a.m. - 5:00 p.m. EST

2. Hazards identification

Emergency overview : WARNING!
FLAMMABLE LIQUID AND VAPOR. CAUSES EYE IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF INHALED OR SWALLOWED. MAY CAUSE SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
Keep away from flames, such as a pilot light, and any object that sparks, such as an electric motor. Keep away from heat. Do not smoke. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : May be harmful if inhaled.
Ingestion : May be harmful if swallowed.
Skin : Moderately irritating to the skin. May cause an allergic skin reaction.
Eyes : Severely irritating to eyes. Risk of serious damage to eyes.

Over-exposure signs/symptoms

Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage. Inhalation of vapor/aerosol concentrations above the recommended exposure limits causes headaches, drowsiness and nausea and may lead to unconsciousness or death. There is some evidence that repeated exposure to organic solvent vapors in combination with constant loud noise can cause greater hearing loss than expected from exposure to noise alone.

Medical conditions aggravated by over-exposure : Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See toxicological information (section 11)

3. Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
NJTS 80100337-5132	Proprietary	60 - 100
propan-2-ol	67-63-0	10 - 30

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available. Never give anything by mouth to an unconscious or convulsing person.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open.
- Skin contact** : Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Do not use solvents or thinners.
- Inhalation** : Remove to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.
- Ingestion** : If swallowed, seek medical advice immediately and show this container or label. Keep person warm and at rest. Do not induce vomiting.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

Flammability of the product : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Extinguishing media

- Suitable** : Use dry chemical, CO₂, water spray (fog) or foam.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Hazardous combustion products** : Decomposition products may include the following materials:
carbon oxides
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6 . Accidental release measures

- Large spill** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Use spark-proof tools and explosion-proof equipment. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.
- Small spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not swallow. Do not get in eyes or on skin or clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. Vapors are heavier than air and may spread along floors. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container. If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.
- Storage** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Do not store above the following temperature: 120F / 49C.

8 . Exposure controls/personal protection

Name	Result	ACGIH	OSHA	Ontario	Mexico	PPG
propan-2-ol	TWA	200 ppm	400 ppm	200 ppm	400 ppm	Not established
	STEL	400 ppm	Not established	400 ppm	500 ppm	Not established

Key to abbreviations

A	= Acceptable Maximum Peak	S	= Potential skin absorption
ACGIH	= American Conference of Governmental Industrial Hygienists.	SR	= Respiratory sensitization
C	= Ceiling Limit	SS	= Skin sensitization
F	= Fume	TD	= Total dust
IPEL	= Internal Permissible Exposure Limit	TLV	= Threshold Limit Value
OSHA	= Occupational Safety and Health Administration.	TWA	= Time Weighted Average
R	= Respirable	Z	= OSHA 29CFR 1910.1200 Subpart Z - Toxic and Hazardous Substances

8 . Exposure controls/personal protection

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Eyes : Chemical splash goggles.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Gloves : butyl rubber

Respiratory : If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Liquid.
Flash point	: Closed cup: 17.78°C (64°F)
Explosion limits	: Lower: 2%
Color	: Not available.
Odor	: Not available.
pH	: Not available.
Boiling/condensation point	: >37.78°C (>100°F)
Melting/freezing point	: Not available.
Specific gravity	: 0.92
Density (lbs / gal)	: 7.68
Vapor pressure	: 4.4 kPa (33 mm Hg)
Vapor density	: Not available.
Volatility	: 31% (v/v), 26.31% (w/w)
Odor threshold	: Not available.
Evaporation rate	: 300 (butyl acetate = 1)

9 . Physical and chemical properties

Octanol/water partition coefficient : Not available.

% Solid. (w/w) : 73.69

10 . Stability and reactivity

Stability : Stable under recommended storage and handling conditions (see section 7).

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Materials to avoid : Reactive or incompatible with the following materials: oxidizing materials, strong acids, strong alkalis

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
propan-2-ol	LD50 Oral	Rat	4.396 g/kg	-
	LD50 Dermal	Rabbit	12800 mg/kg	-
	LC50 Inhalation Vapor	Rat	72600 mg/m ³	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Target organs

: Contains material which causes damage to the following organs: brain.
Contains material which may cause damage to the following organs: upper respiratory tract, skin, eyes, central nervous system (CNS).

Carcinogenicity

Carcinogenicity : No known significant effects or critical hazards.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
propan-2-ol	A4	3	-	-	-	-

Mutagenicity

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity

Teratogenicity : No known significant effects or critical hazards.

Reproductive toxicity

Developmental effects : No known significant effects or critical hazards.

Fertility effects

: No known significant effects or critical hazards.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
propan-2-ol	Acute LC50 >1400000 ug/L	Fish - Bluegill - Lepomis macrochirus	96 hours

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees. Section 6. Accidental release measures

14 . Transport information

Regulation	UN number	Proper shipping name	Classes	PG*	Additional information
UN	1263	Paint.	3	II	-
IMDG	1263	Paint.	3	II	-
DOT	1263	Paint.	3	II	-

PG* : Packing group

Reportable quantity RQ : CERCLA: Hazardous substances.: No products were found.

15 . Regulatory information

United States inventory (TSCA 8b) : All components are listed or exempted.

Australia inventory (AICS) : All components are listed or exempted.

Canada inventory (DSL) : All components are listed or exempted.

China inventory (IECSC) : All components are listed or exempted.

Europe inventory (EINECS) : All components are listed or exempted.

Japan inventory (ENCS) : All components are listed or exempted.

Korea inventory (KECI) : All components are listed or exempted.

New Zealand (NZIoC) : All components are listed or exempted.

Philippines inventory (PICCS) : All components are listed or exempted.

United States

U.S. Federal regulations : TSCA 12(b) annual export notification: No products were found.

TSCA 12(b) one-time export: No products were found.

SARA 302/304/311/312 extremely hazardous substances: No products were found.

SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: propan-2-ol

SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
propan-2-ol: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

15 . Regulatory information

<u>SARA 313</u>	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: propan-2-ol	67-63-0	10 - 30

Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

Canada

WHMIS (Canada) : Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). Class D-2B: Material causing other toxic effects (Toxic).

Mexico

Classification

Flammability : 3 **Health** : 3 **Reactivity** : 0

16 . Other information

Hazardous Material Information System (U.S.A.)

Health : 3 **Flammability** : 3 **Physical hazards** : 0

(*) - Chronic effects

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Health : 3 **Flammability** : 3 **Instability** : 0

Date of previous issue : 7/1/2009.

Organization that prepared the MSDS : EHS

☑ Indicates information that has changed from previously issued version.

Disclaimer

The information contained in this data sheet is based on present scientific and technical knowledge. The purpose of this information is to draw attention to the health and safety aspects concerning the products supplied by PPG, and to recommend precautionary measures for the storage and handling of the products. No warranty or guarantee is given in respect of the properties of the products. No liability can be accepted for any failure to observe the precautionary measures described in this data sheet or for any misuse of the products.

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name C6 Epoxy Adhesive
Version # 01
Revision date 06-09-2010
CAS # Mixture
Product Code C6
Product use Concrete anchoring adhesive.
Manufacturer/Supplier ITW Red Head
2171 Executive Drive, Suite 100
Addison, IL 60101 US
Telephone Number: (630) 350-0370
Contact Person: Andrew Rourke
Emergency CHEMTREC: (800) 424-9300

2. Hazards Identification

Physical state Liquid.
Appearance Paste.
Emergency overview DANGER!

Causes skin and eye burns. Causes severe respiratory tract irritation. Harmful if absorbed through skin or swallowed. May cause sensitization by skin contact. Prolonged exposure may cause chronic effects.

OSHA regulatory status This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

Potential health effects

Routes of exposure Inhalation. Ingestion. Skin contact. Eye contact.

Eyes Causes eye burns. Risk of corneal damage. Contact may cause irritation, redness, tearing, blurred vision and/or burns.

Skin Causes skin burns. Harmful if absorbed through the skin. May cause sensitization by skin contact. Contact may cause irritation, redness and/or drying.

Inhalation Causes severe respiratory tract irritation. Vapors irritate the respiratory system, and may cause coughing and difficulties in breathing.

Ingestion Harmful if swallowed. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Target organs Eyes. Skin. Respiratory system. Lungs.

Chronic effects Overexposure can cause lung damage - pulmonary toxin.

Potential environmental effects The product contains a substance which is toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
Bisphenol A Diglycidyl Ether Resin (Part A)	25068-38-6	60 - 80
Mercaptan/Amine Polymer Blend (Part B)	Trade Secret	20 - 40
2,4,6-Tris(dimethylaminomethyl) Phenol (Part B)	90-72-2	Trade Secret
Isopropanol (Part B)	67-63-0	Trade Secret

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

Skin contact Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Get medical attention.

Ingestion Rinse mouth thoroughly. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.

Notes to physician Keep victim under observation. In case of shortness of breath, give oxygen. Symptoms may be delayed.

General advice Take off contaminated clothing and shoes immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire Fighting Measures

Flammable properties Not flammable by OSHA criteria. Material may burn but not ignite readily.

Extinguishing media

Suitable extinguishing media Water. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO₂).

Protection of firefighters

Protective equipment and precautions for firefighters Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Move containers from fire area if you can do so without risk. Cool containers exposed to flames with water until well after the fire is out. Water runoff can cause environmental damage.

Special protective equipment for fire-fighters Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

Specific methods In the event of fire and/or explosion do not breathe fumes.

Hazardous combustion products Carbon monoxide. Carbon Dioxide. Nitrogen oxides (NO_x). Hydrogen chloride. Sulfur oxides.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the MSDS for Personal Protective Equipment.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not contaminate water.

Methods for containment Stop leak if you can do so without risk. Dike the spilled material, where this is possible. Collect spillage. Prevent entry into waterways, sewers, basements or confined areas.

Methods for cleaning up Small Spills: Absorb spill with vermiculite or other inert material. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Should not be released into the environment.

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system.

Other information Clean up in accordance with all applicable regulations.

7. Handling and Storage

Handling Wear personal protective equipment. Avoid breathing vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged exposure. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. When using, do not eat, drink or smoke. Avoid release to the environment.

Storage Keep container tightly closed. For maximum shelf life, store between 4.4°C (40°F) to 26.7°C (80°F). Do not store above 43.3°C (110°F). Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components

Isopropanol (Part B) (67-63-0)

Type

STEL

TWA

Value

400 ppm

200 ppm

U.S. - OSHA**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	PEL	400 ppm 980 mg/m3

Canada - Alberta**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	STEL	984 mg/m3
		400 ppm
	TWA	492 mg/m3 200 ppm

Canada - British Columbia**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	STEL	400 ppm
	TWA	200 ppm

Canada - Ontario**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	STEL	400 ppm
	TWA	200 ppm

Canada - Quebec**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	STEL	1230 mg/m3
		500 ppm
	TWA	983 mg/m3 400 ppm

Mexico**Components**

	Type	Value
Isopropanol (Part B) (67-63-0)	STEL	1225 mg/m3
		500 ppm
	TWA	980 mg/m3 400 ppm

Engineering controls

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Personal protective equipment**Eye / face protection**

Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Wear chemical-resistant gloves, footwear and protective clothing appropriate for risk of exposure. Contact glove manufacturer for specific information.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment. If permissible levels are exceeded use NIOSH mechanical filter / organic vapor cartridge or an air-supplied respirator.

General hygiene considerations

Avoid contact with eyes. Avoid contact with skin. Provide eyewash station and safety shower. When using, do not eat, drink or smoke. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties**Appearance**

Paste.

Color

Gray/white.

Odor

Characteristic.

Odor threshold

Not available.

Physical state

Liquid.

Form

Liquid. Paste.

pH

Not available.

Melting point

Not available.

Freezing point

Not available.

Boiling point

> 500 °F (> 260 °C) Part A

Flash point

> 200 °F (> 93.3 °C)

Evaporation rate

Not available.

Flammability

Not available.

Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Solubility (water)	None.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Density	1.3 g/cm ³ Part A 1.7 g/cm ³ Part B

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Elevated temperatures.
Incompatible materials	Strong oxidizing agents. Strong acids.
Hazardous decomposition products	Carbon oxides. Nitrogen oxides (NO _x). Sulfur oxides. Hydrogen chloride.
Possibility of hazardous reactions	Will not occur by itself. More than 1 pound of the Part B material added to epoxy resins will cause irreversible polymerization with considerable heat build-up.

11. Toxicological Information

Toxicological data

Components	Test Results
Isopropanol (Part B) (67-63-0)	Acute Dermal LD50 Rabbit: 5030 - 7900 mg/kg Acute Oral LD50 Rat: 4700 - 5800 mg/kg
Mercaptan/Amine Polymer Blend (Part B) (Trade Secret)	Acute Dermal LD50 Rabbit: > 10000 mg/kg Acute Oral LD50 Rat: > 3000 mg/kg
Local effects	Causes skin and eye burns. Causes severe respiratory tract irritation. Harmful in contact with skin and if swallowed. May cause sensitization by skin contact.
Sensitization	May cause an allergic skin reaction.
Chronic effects	Overexposure can cause lung damage.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
ACGIH Carcinogens	
Isopropanol (Part B) (CAS 67-63-0)	A4 Not classifiable as a human carcinogen.
Epidemiology	This product is not reported to cause epidemiological effects in humans.
Mutagenicity	This product is not expected to cause mutagenic or genotoxic effects.
Neurological effects	Not available.
Reproductive effects	Isopropyl alcohol has demonstrated animal effects of reproductive toxicity.
Teratogenicity	Isopropyl alcohol has demonstrated animal effects of teratogenicity.
Further information	Symptoms may be delayed.

12. Ecological Information

Ecotoxicological data

Components	Test Results
Isopropanol (Part B) (67-63-0)	LC50 Bluegill (<i>Lepomis macrochirus</i>): > 1400 mg/l 96 hours
Ecotoxicity	Contains a substance which causes risk of hazardous effects to the environment.
Environmental effects	The product contains a substance which is toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Persistence and degradability	Not available.

Bioaccumulation / Accumulation	No data available.
Partition coefficient (n-octanol/water)	Not available.
Mobility in environmental media	No data available.

13. Disposal Considerations

Disposal instructions Dispose of contents/container in accordance with local/regional/national/international regulations. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. Do not contaminate ponds, waterways or ditches with chemical or used container.

14. Transport Information

Product Specific Note: This product meets the limited quantities exception requirements for the below listed transportation agencies. Under DOT and TDG regulations, this product may be reclassified as a Consumer Commodity (ORM-D). Please see the specific regulations for the shipping and packaging requirements.

DOT

Basic shipping requirements:

Proper shipping name	Consumer commodity
Hazard class	ORM-D
Subsidiary hazard class	None
Labels required	None

Additional information:

Packaging exceptions	156, 306
Packaging non bulk	156, 306
Packaging bulk	None

IATA

Basic shipping requirements:

UN number	2735
Proper shipping name	Amines, liquid, corrosive, n.o.s. (2,4,6-Tris(dimethylaminomethyl) Phenol (Part B))
Hazard class	8
Packing group	III

IMDG

Basic shipping requirements:

UN number	2735
Proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S. (2,4,6-Tris(dimethylaminomethyl) Phenol (Part B))
Hazard class	8
Packing group	III
EmS No.	F-A, S-B

TDG

Basic shipping requirements:

Proper shipping name	Consumer commodity
Hazard class	ORM-D
Subsidiary hazard class	None
Labels required	None

Additional information:

Packaging exceptions	156, 306
Packaging non bulk	156, 306
Packaging bulk	None



IATA



IMDG

15. Regulatory Information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

Isopropanol (Part B) (CAS 67-63-0) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

Isopropanol (Part B) (CAS 67-63-0) Listed.

CERCLA (Superfund) reportable quantity (lbs)

Isopropanol (Part B) 100

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance

No

Section 311 hazardous chemical

No

Drug Enforcement Agency (DEA)

Not controlled

Canadian regulations

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS status

Controlled

WHMIS classification

D2B - Other Toxic Effects-TOXIC
E - Corrosive

WHMIS labeling



Inventory status

Country(s) or region

Inventory name

On inventory (yes/no)*

Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance

Isopropanol (Part B) (CAS 67-63-0) Listed.

US - Massachusetts RTK - Substance: Listed substance

Isopropanol (Part B) (CAS 67-63-0) Listed.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

Isopropanol (Part B) (CAS 67-63-0) 500 LBS

US - Pennsylvania RTK - Hazardous Substances: Listed substance

Isopropanol (Part B) (CAS 67-63-0) Listed.

16. Other Information

Further information HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings Health: 2*
Flammability: 1
Physical hazard: 1

NFPA ratings Health: 2
Flammability: 1
Instability: 0

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available.

Issue date 06-09-2010

MATERIAL SAFETY DATA SHEET

ISSUE DATE: 11/14/96

REVISED DATE: 3/25/02

Supersedes: Any Previous M.S.D.S. On This Product

EMERGENCY PHONE NUMBER: CHEM-TEL, INC. 1-800-255-3924

I. IDENTIFICATION

PRODUCT NAME: NEOPRENE GASKET
PRODUCT CLASS: RUBBER

C.L. Ward & Family Inc.
1460 Delbert's Drive
Monongahela, PA 15063

II. HAZARDOUS INGREDIENTS

<u>MATERIAL</u>	<u>% WEIGHT</u>	<u>OSHA PEL</u>	<u>ACGIH TLV</u>
Neoprene	100	NA	NA

III. PHYSICAL DATA

APPEARANCE: Black Strip
SOLUBILITY IN WATER: Negligible
SPECIFIC GRAVITY: 0.11-0.32

IV. HEALTH HAZARD DATA

ROUTE OF EXPOSURE: The product is physically handled, but under normal use, presents no serious hazard.

EFFECTS OF OVEREXPOSURE:

Acute Effect: No acute effects have been associated with the neoprene rubber.

Chronic Effects: No chronic effects have been associated with the neoprene rubber.

V. EMERGENCY AND FIRST AID

INHALATION: N/A

SKIN CONTACT: Wash area of contact with soap and water if irritated.

EYE CONTACT: Flush immediately with running water for fifteen minutes. If irritation persists, seek medical attention.

INDIGESTION: N/A

VI. FIRE AND EXPLOSION HAZARDS

FLASH POINT: N/A

The neoprene is fire-resistant relative to hydrocarbon rubbers.

EXTINGUISHING MEDIA: Use foam to extinguish the fire.

VII. SPILL OR LEAK PROCEDURES

Any scrap should be swept into a closed container for refuse or disposal.

WASTE DISPOSAL METHOD: Dispose of in accordance with appropriate federal, state, and local regulations.

VIII. SPECIAL PROTECTION

VENTILATION: General exhaust ventilation should be provided to keep worker exposures at a minimum.

RESPIRATORY PROTECTION: Equipment is not normally required. However, abnormal conditions may require one to wear NIOSH respirator equipment.

EYE PROTECTION: Personal protective equipment should be worn when there is a reasonable probability of injury.

PROTECTIVE GLOVES: As needed.

IX. CARCINOGENIC ASSESSMENT

The neoprene has NOT been identified as a suspect carcinogen by NTP, IARC, or OSHA.

X. REACTION DATA

STABILITY: Stable under normal conditions of handling and use.

CONDITIONS TO AVOID: Extreme heat source.

INCOMPATIBILITY: N/A

HAZARDOUS DECOMPOSITION PRODUCT: N/A

HAZARDOUS POLYMERIZATION: Will not occur.

XI. SPECIAL PRECAUTIONS

HANDLING AND STORAGE: Keep containers closed and store away from extreme heat and cold. DO NOT FREEZE. Keep away from chemicals that react with water.

This information is taken from sources or based upon data believed to be reliable; however, C.L. WARD & FAMILY INC. makes no warranty as to the absolute correctness or sufficiency of any of the foregoing or that additional or other measures may not be required under particular conditions.

ITW Ramset/Red Head

MATERIAL SAFETY DATA SHEET

These products do not meet the criteria of hazardous chemicals as defined by the Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200(c)). This form is being provided solely as general information and should not be construed as a determination that the product(s) are hazardous chemical(s).

GENERAL INFORMATION

Manufacturer: ITW Ramset/Red Head Date: August 1, 2005
1300 North Michael Drive
Wood Dale, Illinois 60191

Phone Number: (630) 350-0370

PRODUCT IDENTIFICATION

Product Name: Metal Fasteners (concrete anchors, powder actuated fasteners, gas powered fasteners) and Masonry Drill Bits.

Formula: N/A

TYPICAL CHEMICAL COMPOSITION

Various Metals, Ferrous and Non-Ferrous Platings

Coatings (optional): See "Additional or Miscellaneous Information"

PHYSICAL DATA

Physical State:	Solid
Appearance:	Various Shapes
Boiling Point:	N/A
Melting Point:	Greater Than 1400° F
Solubility in Water:	N/A
pH:	N/A
Specific Gravity:	7.6 - 7.8
Vapor Pressure:	N/A
Vapor Density:	N/A
Evaporation Rate:	N/A
% Volatile by Volume:	N/A
Odor:	None

FIRE AND EXPLOSION HAZARD DATA

Not Applicable

REACTIVITY DATA

Stability:	Stable
Hazardous Decomposition Products:	None Anticipated
Incompatible (Materials to Avoid):	Acids
Polymerization:	Will Not Occur

HEALTH HAZARD DATA

Health Effects/Signs and Symptoms:	Not Applicable
Usual Route(s) of Entry:	Sharp Metal Fasteners May Cut Skin
Medical Conditions Possible Aggravated:	None Known
Carcinogen Information:	None Known

Eye Contact:	Not anticipated to pose a significant eye hazard.
Skin Contact:	Not anticipated to pose a significant skin hazard.
Ingestion:	Not anticipated to pose a significant ingestion hazard.
Inhalation:	Not considered an inhalation hazard.

OCCUPATIONAL EXPOSURE CONTROL MEASURES

Eye Protection:	Safety Glasses Recommended
Skin Protection:	Gloves Recommended
Ingestion:	Never place metal fasteners into mouth.

SPILL, LEAK AND DISPOSAL INFORMATION

Procedures to follow if material is released or spilled: N/A

Waste Disposal Method(s): Any excess product can be recycled for further use or disposed by methods which are in accordance with local, state and federal regulations.

ADDITIONAL OR MISCELLANEOUS INFORMATION

Coatings are applied to the surface of metal products. These are usually classified as protective coatings or lubricants. The typical coatings are as follows:

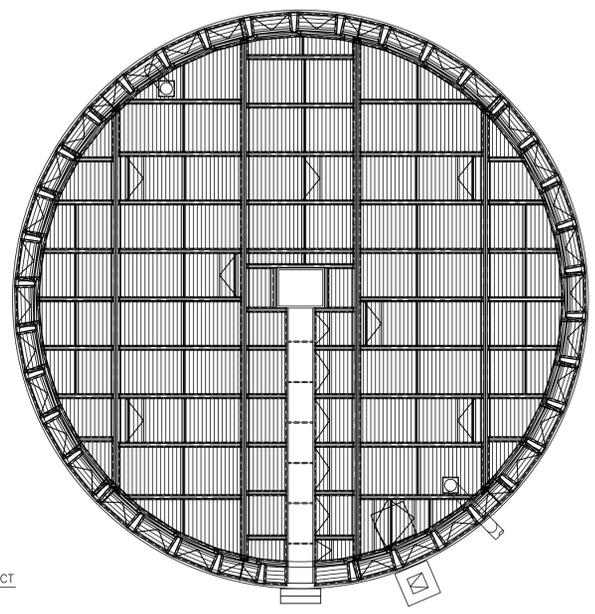
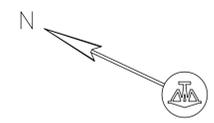
Zinc Plating / Chromate
Dyeing (Color Identification)

The possible presence of these coatings on metal products should be recognized when evaluating potential employee health hazards and exposures during normal use.

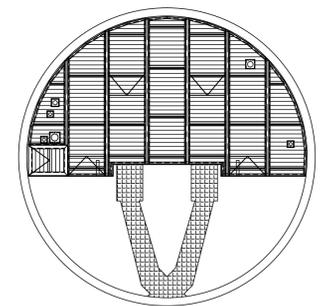
- GENERAL NOTES AND SPECIFICATIONS:**
- ALUMINUM COVER DESIGN LOADS:
 LIVE LOAD: 40 psf
 DEAD LOAD: 3.5 psf
 CONC. LOAD: 400 # (NON-CONCURRENT WITH LIVE LOAD)
 CONC. LOAD AREA: 12" X 12"
 DEFLECTION LIMIT: L/180
 WIND LOAD BASIS: 85 MPH
 REFERENCED CODE: IBC 2006, ASCE 7-05
 MAX. PANEL WEIGHT: 150 lbs
 - MATERIALS:
 ALUMINUM: ALUMINUM DESIGN SHALL CONFORM TO THE ALUMINUM DESIGN MANUAL, THE ALUMINUM ASSOCIATION, 2000. ALL ALUMINUM COMPONENTS TO BE TYPE 6061-T6.
 WELDS: WELDING SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY D1.2 STRUCTURAL WELDING CODE. ALUMINUM WELD FILLER METAL TO BE ALLOY 4043.
 FASTENERS: ALL FASTENERS AND ANCHORS SHALL BE STAINLESS STEEL TYPE 316.
 - ANODIZATION:
 ALL ALUMINUM TRUSSES ON PRIMARY CLARIFIER NO. 1 AND PRIMARY CLARIFIER NO. 2 SHALL BE ANODIZED, MANUFACTURER'S STANDARD COLOR-DARK BRONZE AFTER FABRICATION. SOME COLOR DISCREPANCIES BETWEEN COMPONENTS WILL OCCUR.
 - VERIFICATION:
 HALLSTEN HAS VERIFIED ALL DIMENSIONS, LOCATIONS AND ELEVATIONS ON PRIOR TO FABRICATION EXCEPT PRIMARY CLARIFIER NO. 1.
 - SITE INSTALLATION:
 CONTRACTOR SHALL REPORT ANY AND ALL FIELD DISCREPANCIES TO MANUFACTURER FOR RESOLUTION. CONTRACTOR IS RESPONSIBLE FOR PROPER HANDLING AND STORAGE OF MATERIALS TO AVOID DAMAGE TO COMPONENTS. TEMPORARY BRACING OR SUPPORT, WHERE REQUIRED, IS THE RESPONSIBILITY OF THE INSTALLATION CONTRACTOR.
 - WELD INSPECTION:
 ALL STRUCTURAL WELDS SHALL BE VISUALLY INSPECTED (100%).

- SYMBOLS:**
-  PANEL IDENTIFICATION NUMBER FOR REGULAR DECK SLATS
 -  HATCH SHOWING HINGE AT LEFT
 -  DECK PENETRATION KIT, SEE DETAIL AS NOTED
 -  BEAM IDENTIFICATION NUMBER

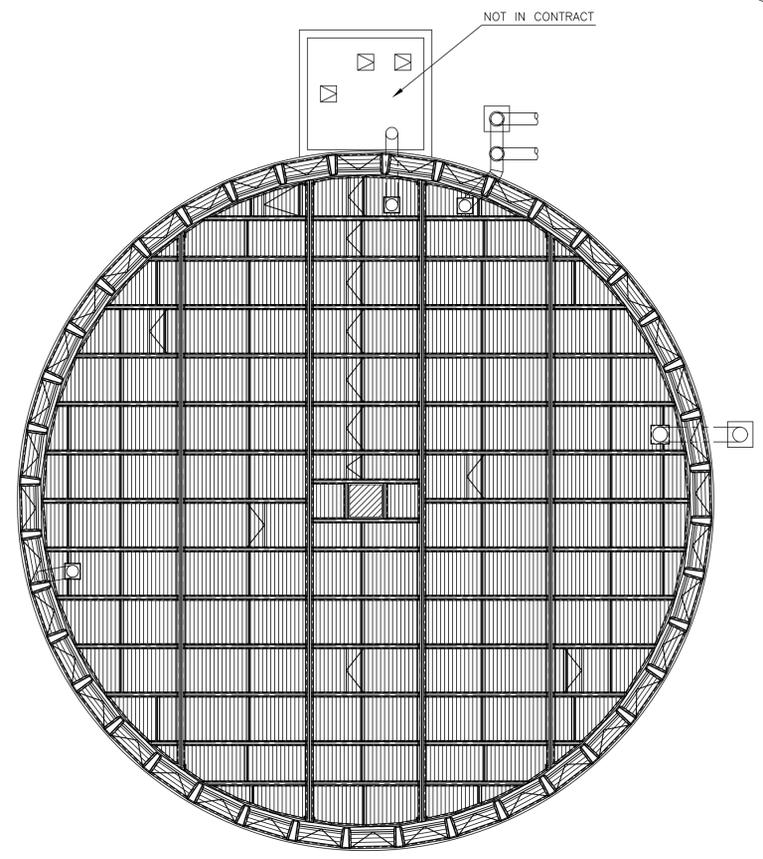
SHEET INDEX	
SHEET #	DESCRIPTION
1	LAYOUT, SYMBOLS AND NOTES
2	PRIMARY CHARIFIER COVER NO. 1 LAYOUT PLAN VIEW
3	PRIMARY CHARIFIER BEAM NO. 1 LAYOUT PLAN VIEW
4	PRIMARY CHARIFIER TRUSS NO. 1 LAYOUT PLAN VIEW
5	TRUSS SECTIONS & DETAILS
6	PRIMARY CHARIFIER COVER NO. 2 LAYOUT PLAN VIEW
7	PRIMARY CHARIFIER BEAM NO. 2 LAYOUT PLAN VIEW
8	PRIMARY CHARIFIER TRUSS NO. 2 LAYOUT PLAN VIEW
9	TRUSS SECTIONS & DETAILS
10	TRUSS SECTIONS & DETAILS
11	TRUSS SECTIONS & DETAILS
12	PUMP STATION WET WELL COVER LAYOUT PLAN VIEW
13	PUMP STATION WET WELL LEDGER ANGLE LOCATION LAYOUT
14	BEAM SECTIONS
15	BEAM SECTIONS
16	BEAM SECTIONS
17	BEAM SECTIONS
18	BEAM SECTIONS
19	BEAM SECTIONS
20	DETAILS & SECTIONS
21	DETAILS & SECTIONS
22	DETAILS & SECTIONS
23	DETAILS & SECTIONS



PRIMARY CLARIFIER NO. 2



PUMP STATION WET WELL



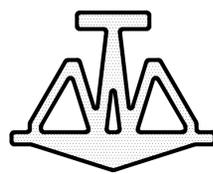
PRIMARY CLARIFIER NO. 1

COVER LAYOUT PLAN VIEW
SCALE: 3/32" = 1'-0"

AS BUILT

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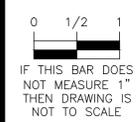
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WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
 WENATCHEE, WA

**LAYOUT,
 SYMBOLS AND
 NOTES**



Date:	05 JAN 12
Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	1 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH

A

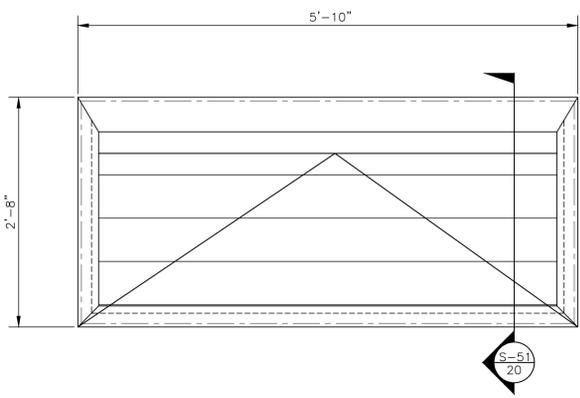
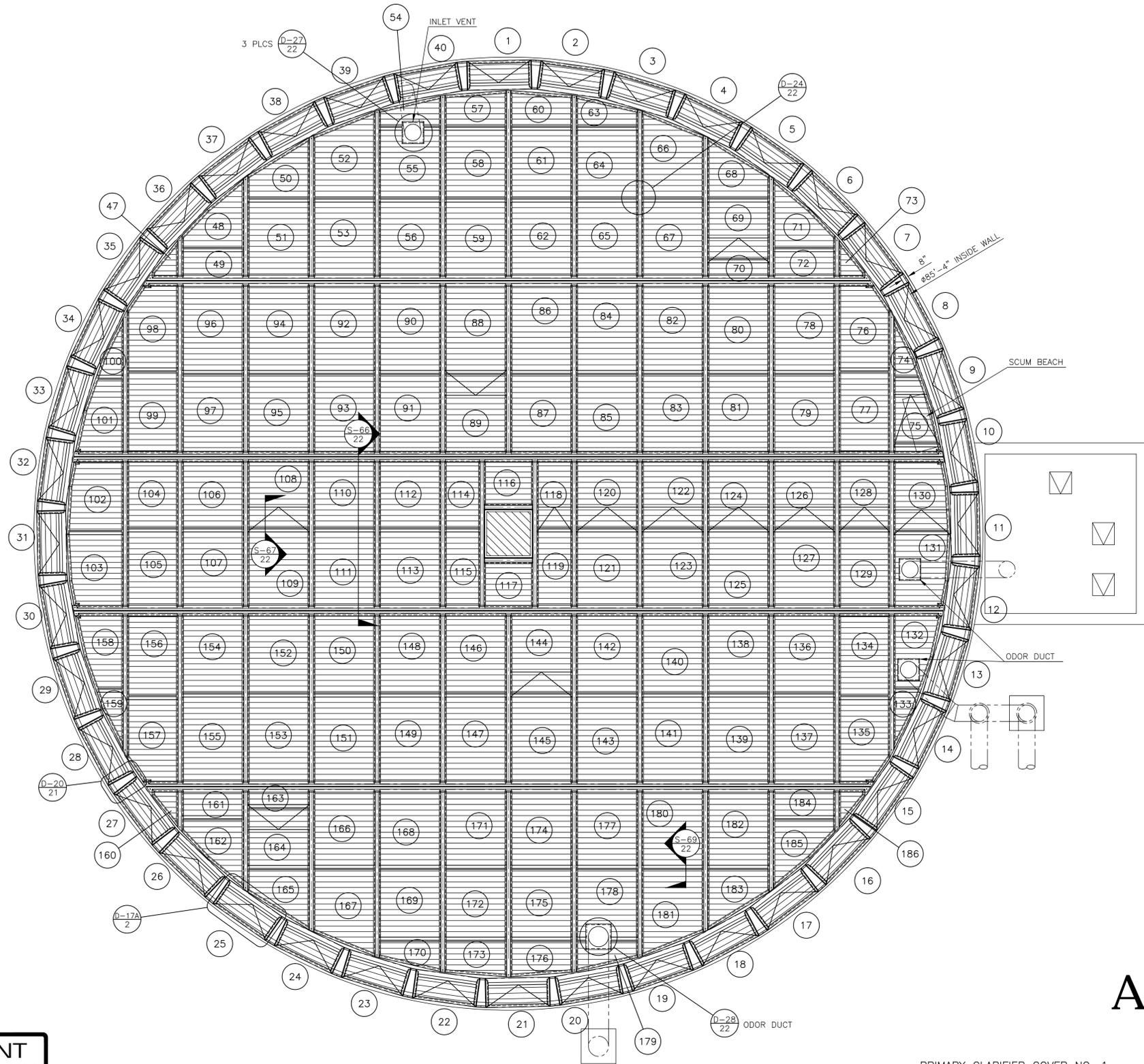
B

C

D

E

F



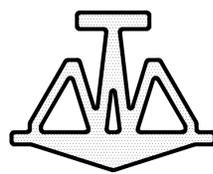
D-17A ANNULAR PANEL DETAIL VIEW
 2 SCALE: 1" = 1'-0"
 MAKE (40) FORTY FOR TANK #1

AS BUILT

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PRIMARY CLARIFIER COVER NO. 1
 SCALE: 3/16" = 1'-0"



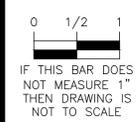
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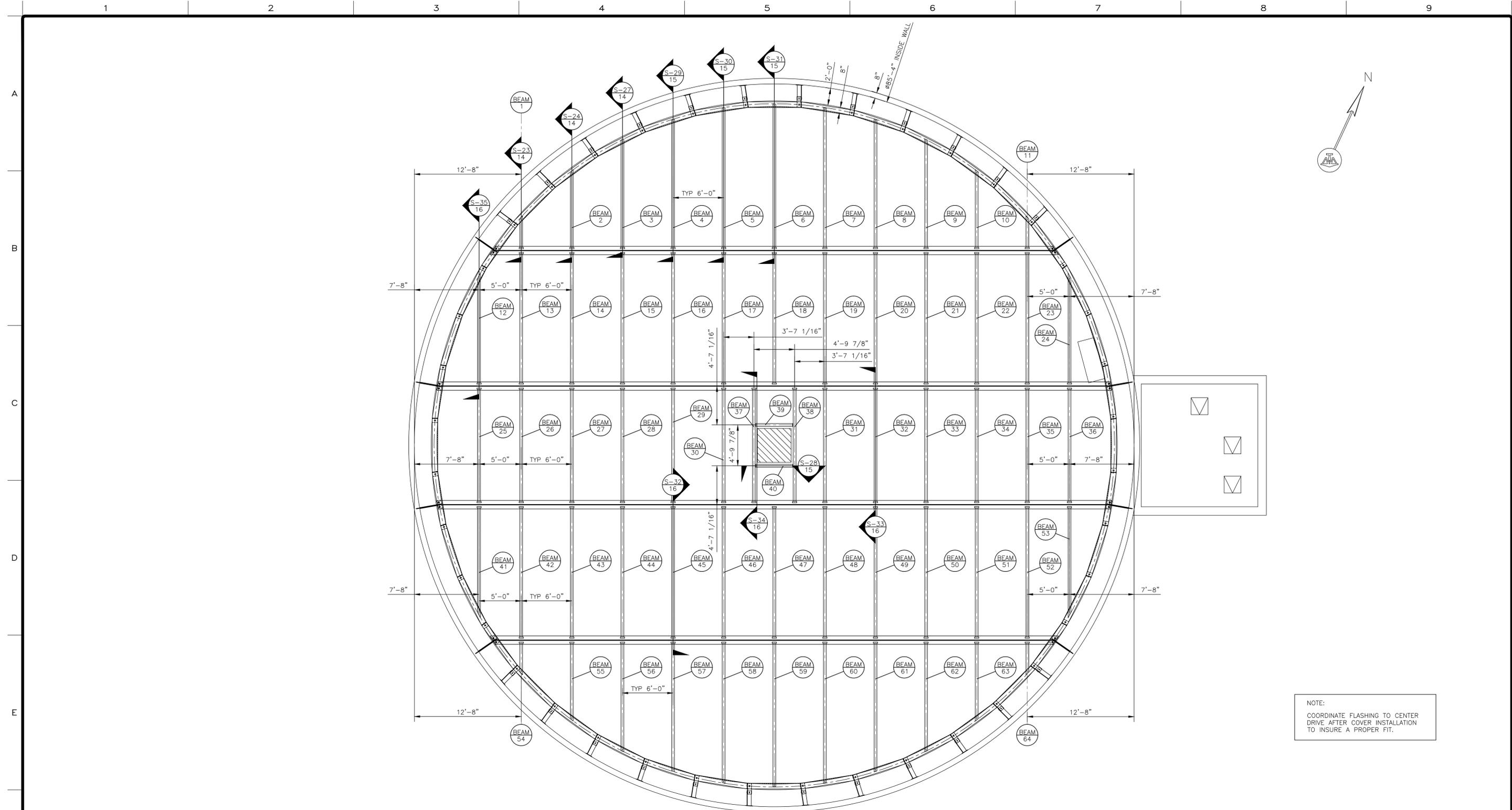
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
 WENATCHEE, WA

PRIMARY CLARIFIER COVER NO. 1 LAYOUT PLAN VIEW



Date:	05 JAN 12
Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	2 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH

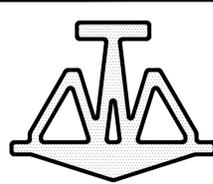


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BEAM LAYOUT PLAN VIEW
SCALE: 3/16" = 1'-0"



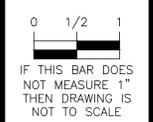
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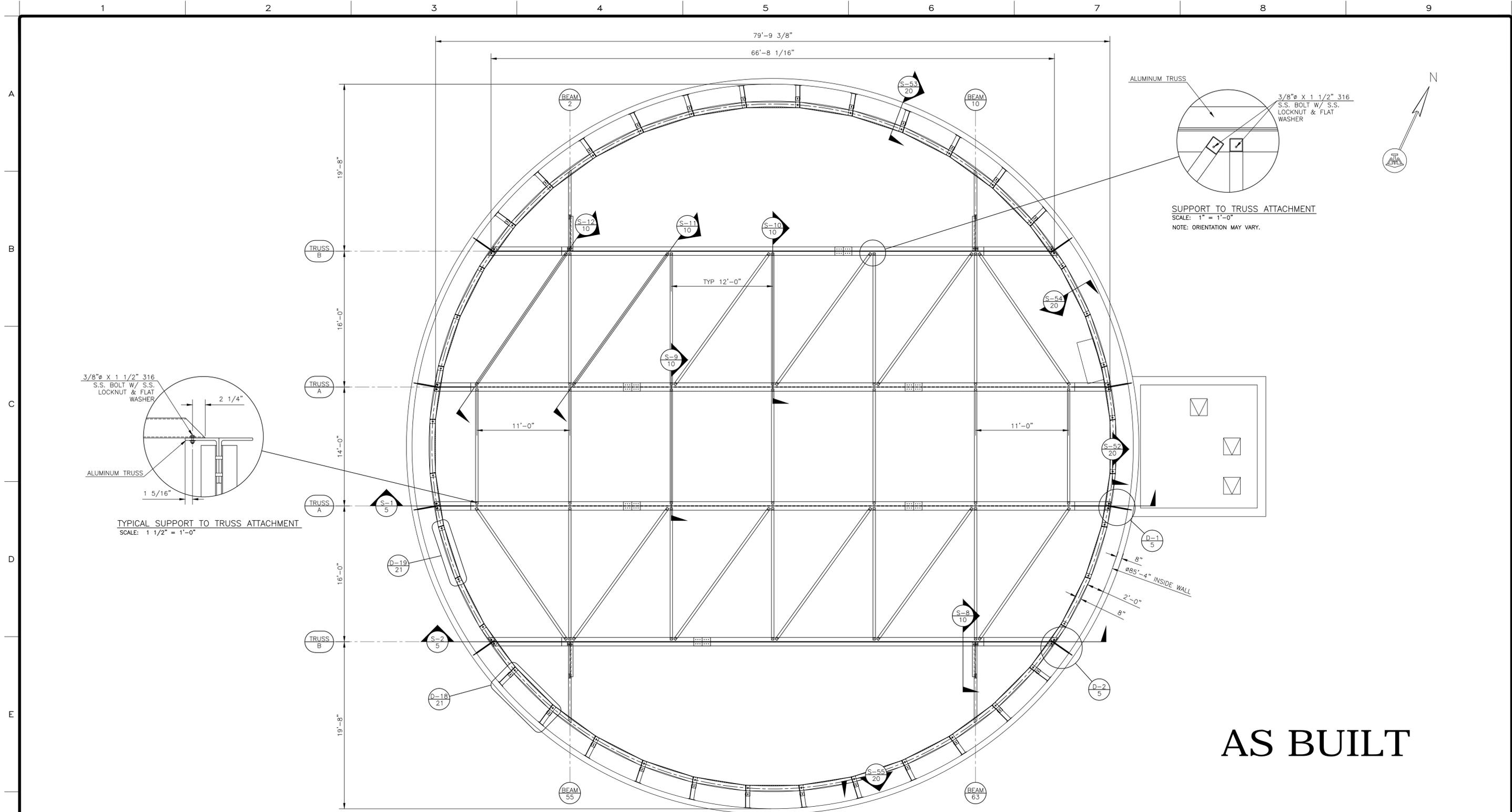
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
WENATCHEE, WA

**PRIMARY CLARIFIER
BEAM NO. 1
LAYOUT PLAN VIEW**



Date:	05 JAN 12
Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	3 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH



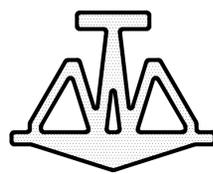
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TRUSS LAYOUT PLAN VIEW
SCALE: 3/16" = 1'-0"



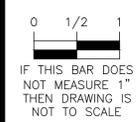
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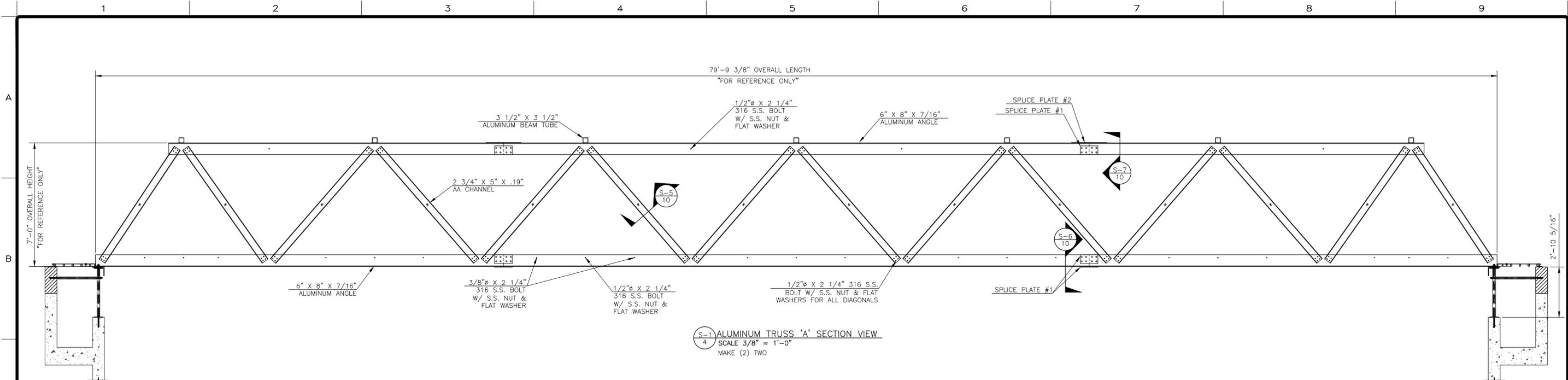
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
WENATCHEE, WA

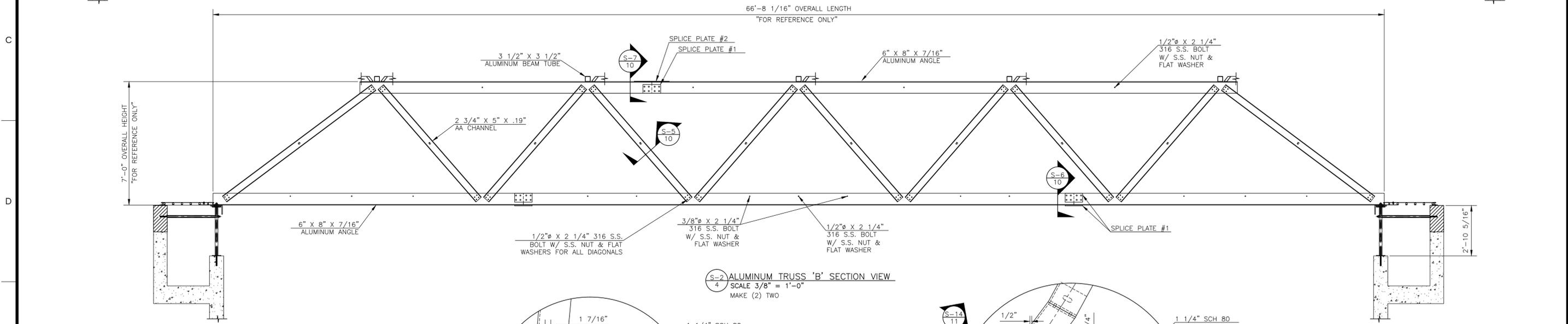
PRIMARY CLARIFIER
TRUSS NO. 1
LAYOUT PLAN VIEW



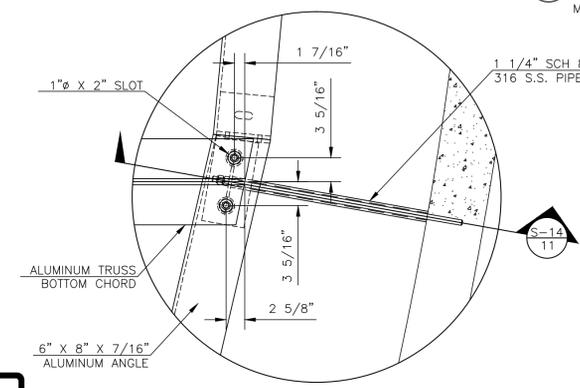
Date:	05 JAN 12		
Manager:	R. KUEHNE		
Drawn By:	B. HILLENBURG		
Sheet:	4 of 23		
Dwg. No.:	11349		
REVISIONS			
4	12 SEP 12	BKH	
3	28 AUG 12	BKH	
2	12 JUN 12	BKH	
1	23 MAY 12	BKH	



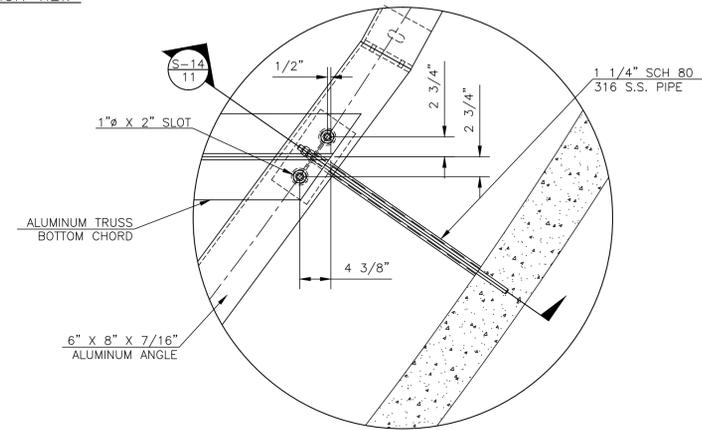
S-1 ALUMINUM TRUSS 'A' SECTION VIEW
 SCALE 3/8" = 1'-0"
 MAKE (2) TWO



S-2 ALUMINUM TRUSS 'B' SECTION VIEW
 SCALE 3/8" = 1'-0"
 MAKE (2) TWO



D-1 TRUSS "A" DETAIL VIEW
 SCALE: 1" = 1'-0"



D-2 TRUSS "B" DETAIL VIEW
 SCALE: 1" = 1'-0"

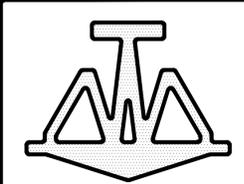
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AS BUILT

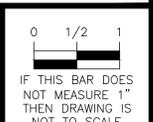
- SPECIAL NOTES:
- BOLT ASSEMBLIES NOT SHOWN FOR CLARITY.
 - 'A' TRUSSES TO HAVE 5" OF CAMBER AT TRUSS CENTER.
'B' TRUSSES TO HAVE 3 1/2" OF CAMBER AT TRUSS CENTER.



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WASTEWATER TREATMENT PLANT IMPROVEMENTS
 ALUMINUM COVERS
 WENATCHEE, WA
 TRUSS
 SECTIONS & DETAILS



Date:	05 JAN 12		
Manager:	R. KUEHNE		
Drawn By:	B. HILLENBURG		
Sheet:	5 of 23		
Dwg. No.:	11349		
REVISIONS			
4	12 SEP 12	BKH	
3	28 AUG 12	BKH	
2	12 JUN 12	BKH	
1	23 MAY 12	BKH	

A

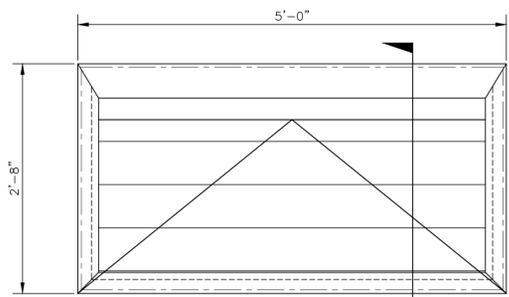
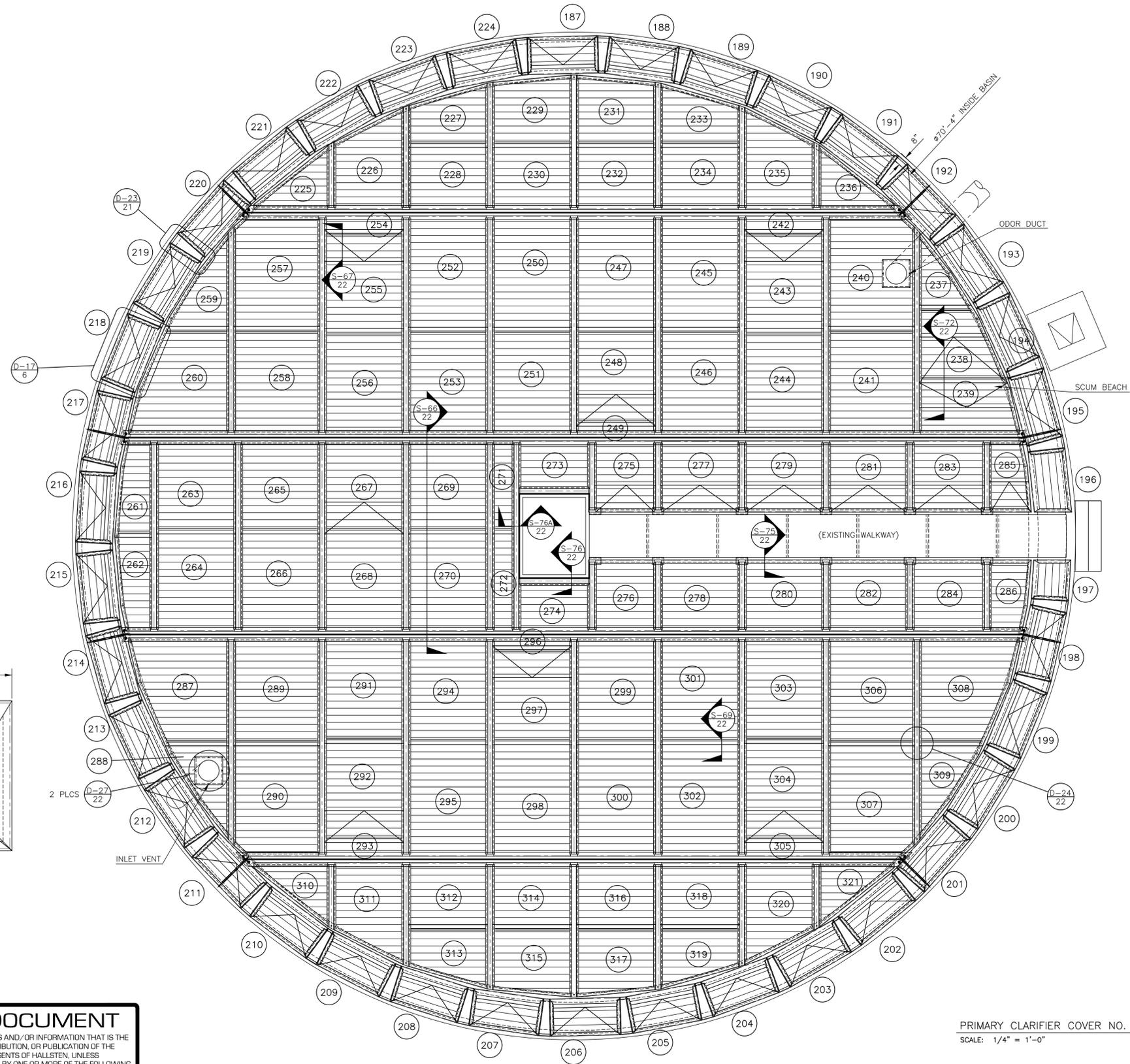
B

C

D

E

F



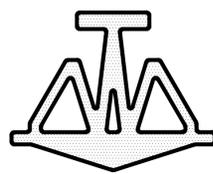
(D-17) ANNULAR PANEL DETAIL VIEW
SCALE: 1" = 1'-0"
MAKE (36) THIRTY-SIX FOR TANK #2

AS BUILT

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PRIMARY CLARIFIER COVER NO. 2
SCALE: 1/4" = 1'-0"



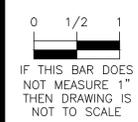
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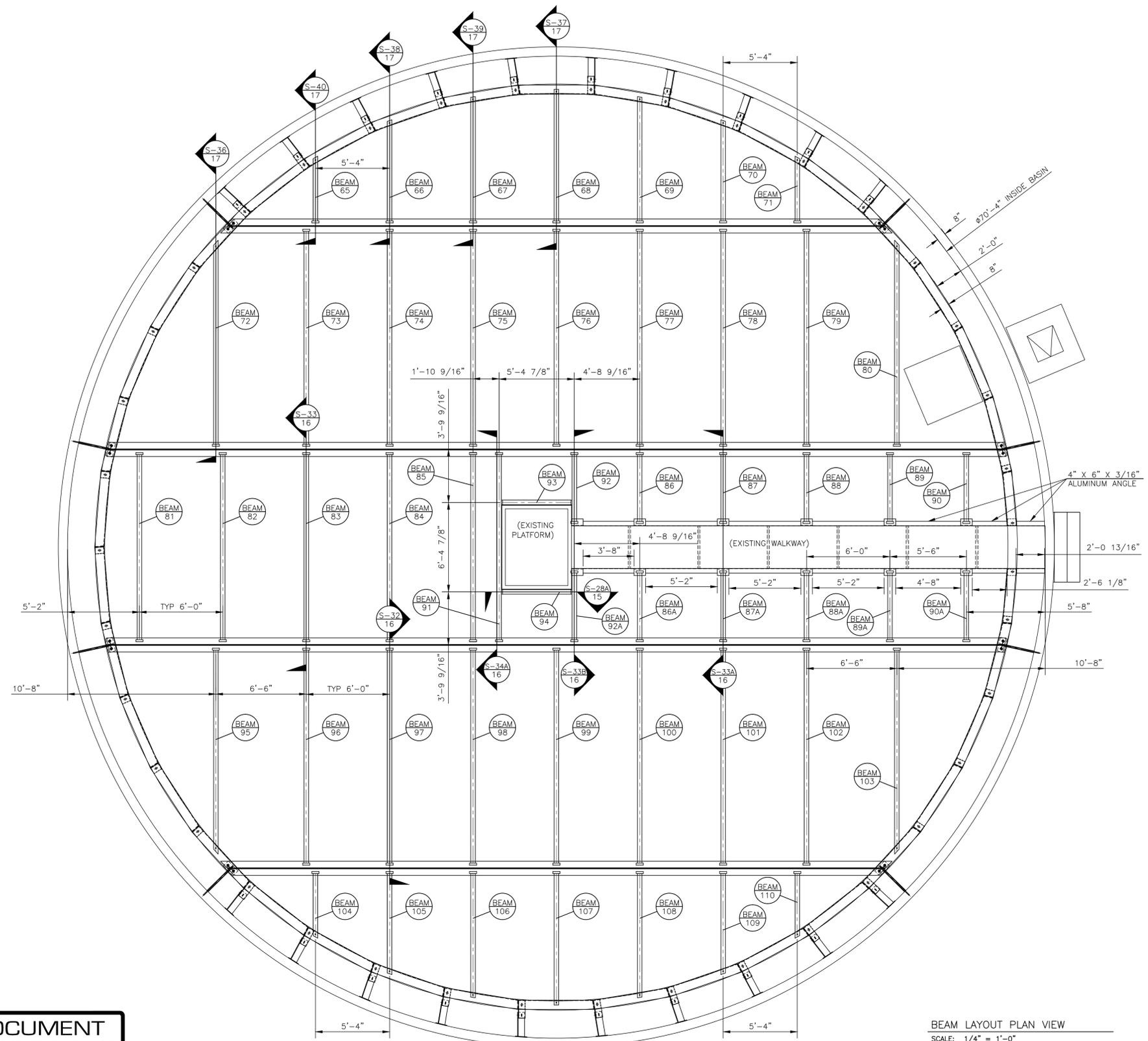
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
WENATCHEE, WA

PRIMARY CLARIFIER
COVER NO. 2
LAYOUT PLAN VIEW



Date:	05 JAN 12
Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	6 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH

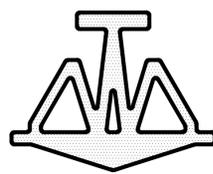


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BEAM LAYOUT PLAN VIEW
SCALE: 1/4" = 1'-0"



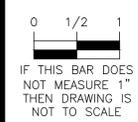
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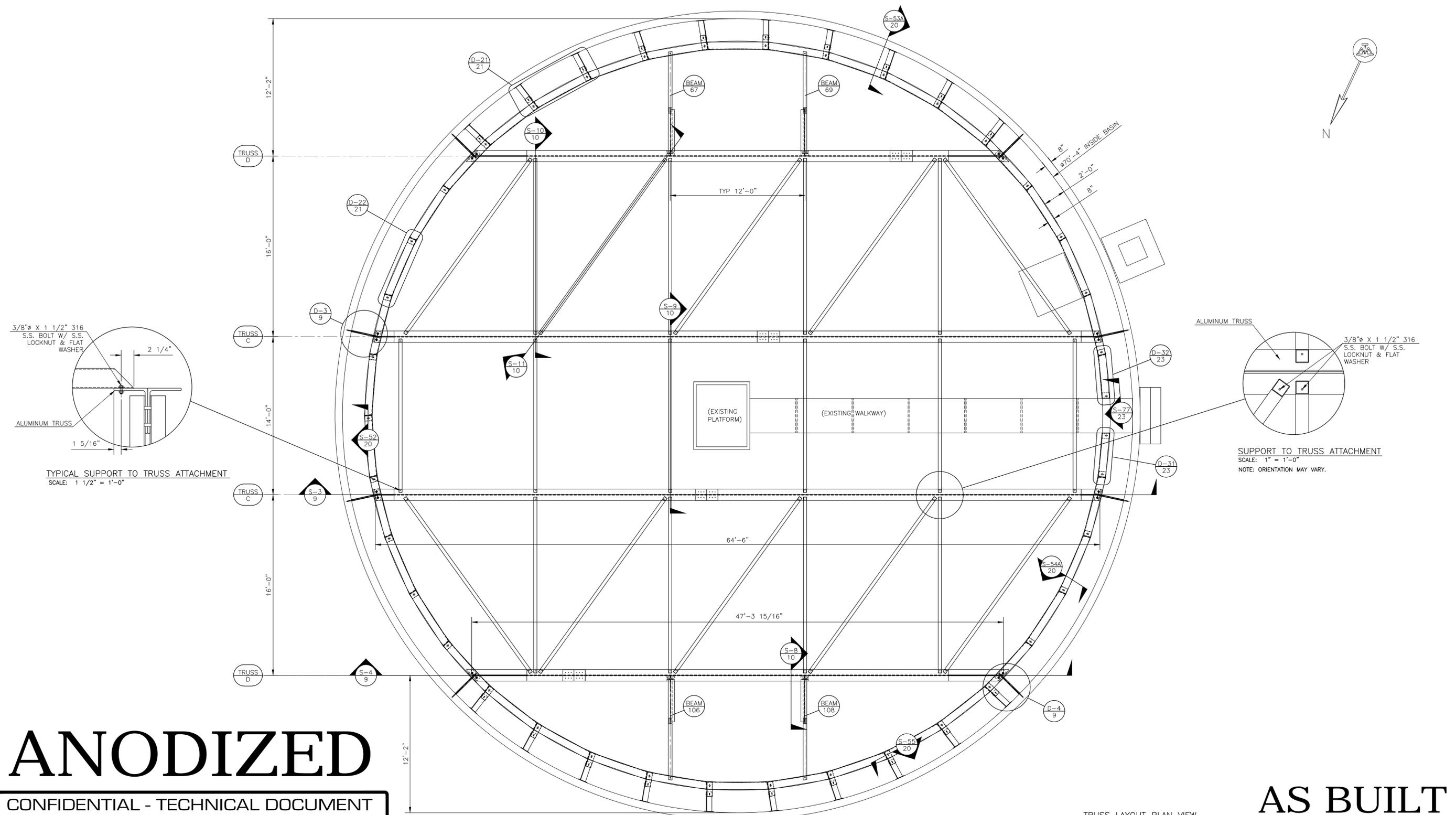
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS
WENATCHEE, WA

**PRIMARY CLARIFIER
BEAM NO. 2
LAYOUT PLAN VIEW**



Date:	05 JAN 12
Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	7 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH



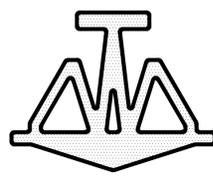
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AS BUILT

TRUSS LAYOUT PLAN VIEW
SCALE: 1/4" = 1'-0"



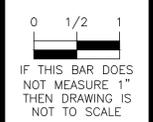
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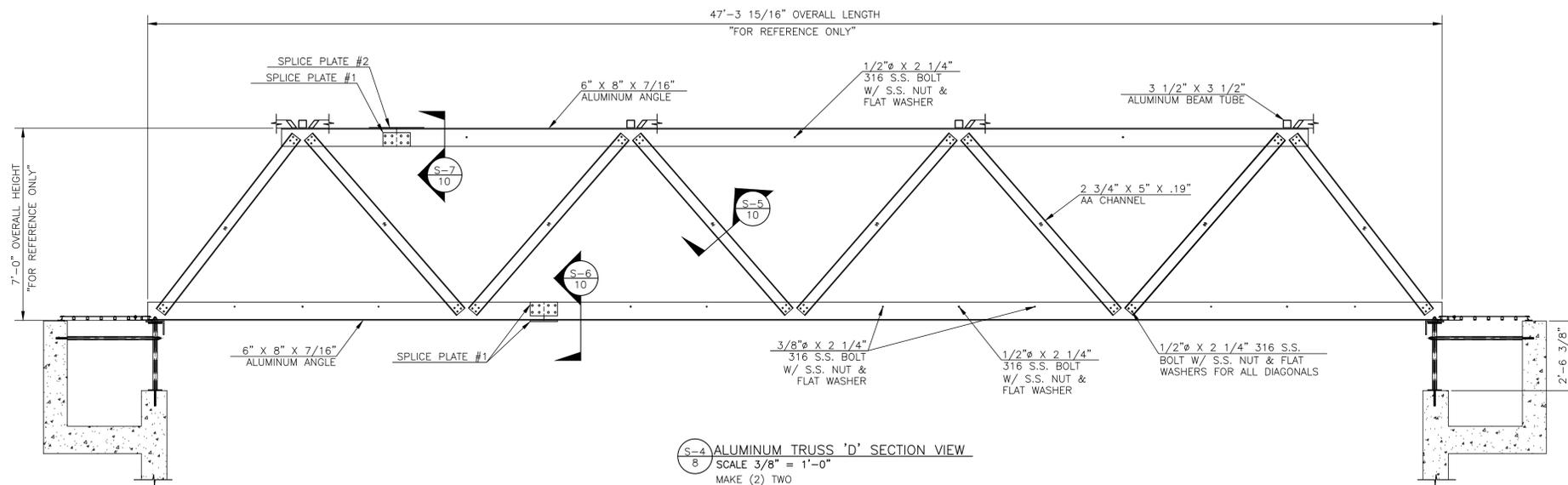
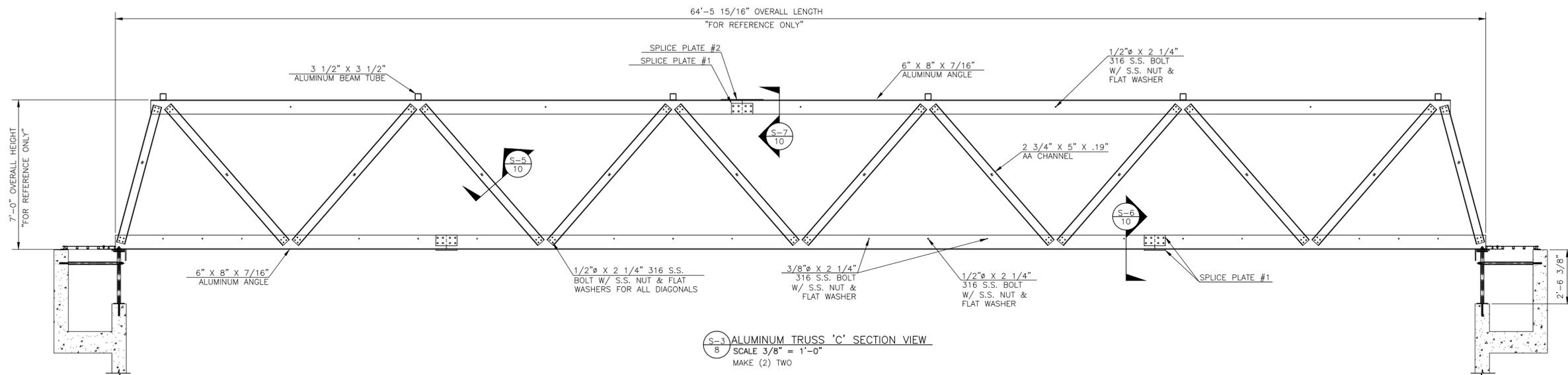
WASTEWATER TREATMENT PLANT IMPROVEMENTS

ALUMINUM COVERS WENATCHEE, WA

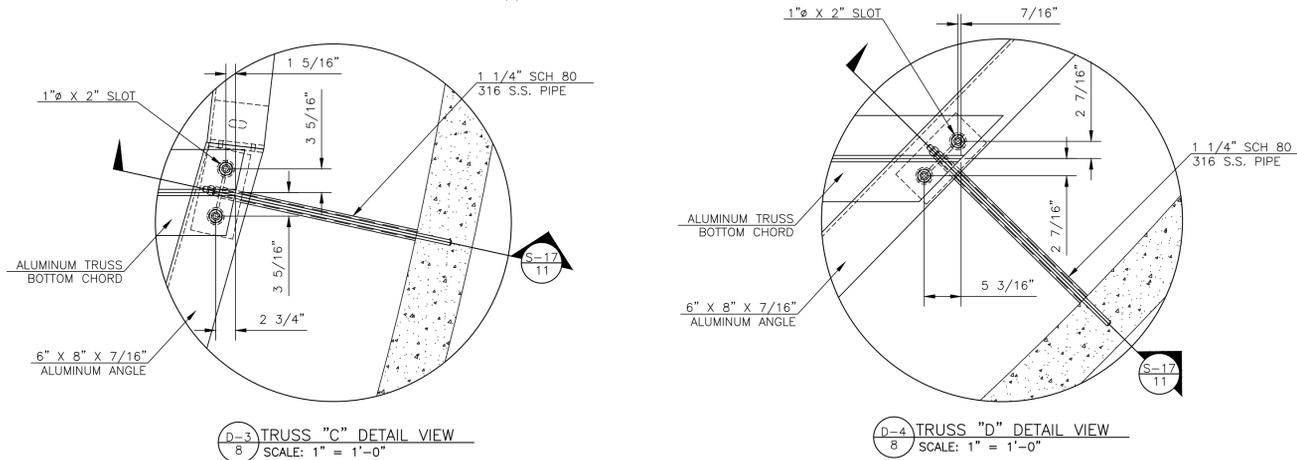
PRIMARY CLARIFIER TRUSS NO. 2 LAYOUT PLAN VIEW



Date:	05 JAN 12		
Manager:	R. KUEHNE		
Drawn By:	B. HILLENBURG		
Sheet:	8 of 23		
Dwg. No.:	11349		
REVISIONS			
4	12 SEP 12	BKH	
3	28 AUG 12	BKH	
2	12 JUN 12	BKH	
1	23 MAY 12	BKH	



SPECIAL NOTES:
1. BOLT ASSEMBLIES NOT SHOWN FOR CLARITY.
2. 'C' TRUSSES TO HAVE 4 1/2" OF CAMBER AT TRUSS CENTER.
'D' TRUSSES TO HAVE 2 1/2" OF CAMBER AT TRUSS CENTER.

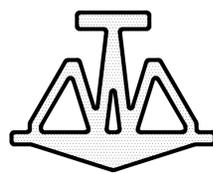


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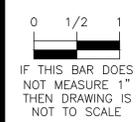
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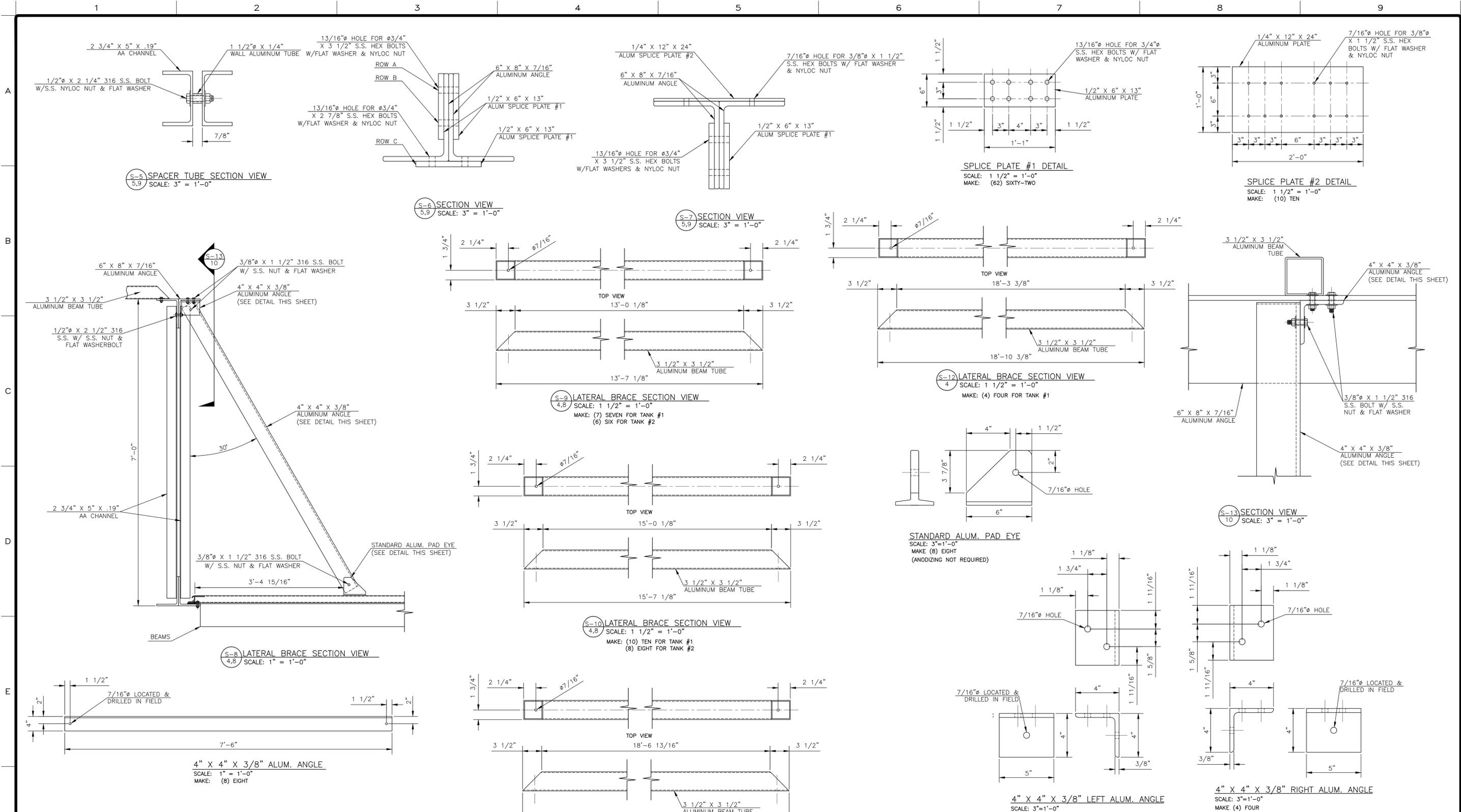
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ALUMINUM COVERS
WENATCHEE, WA

TRUSS
SECTIONS & DETAILS



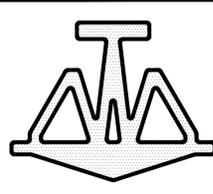
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Drawn By:	B. HILLENBURG
Sheet:	9 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
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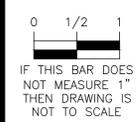
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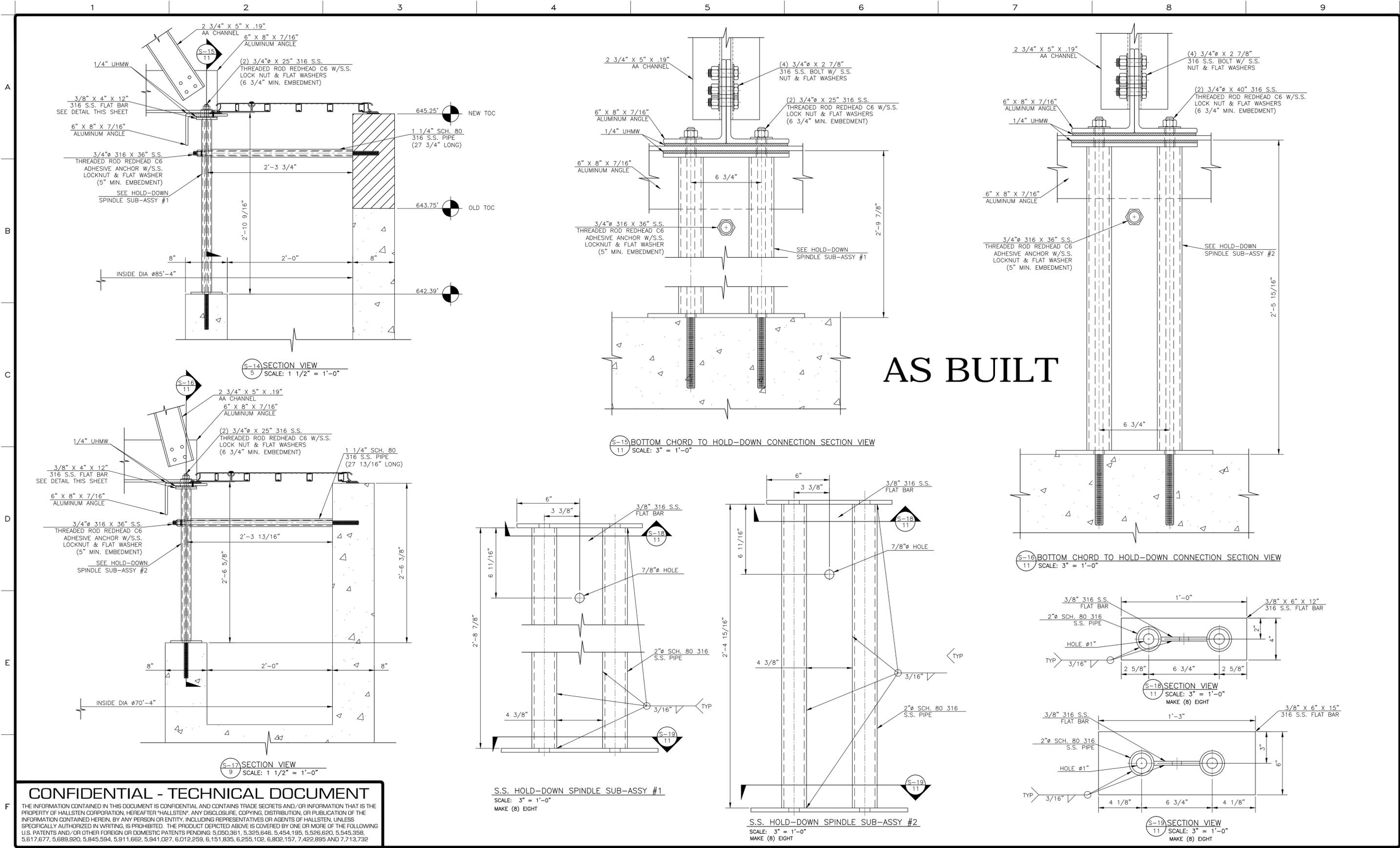
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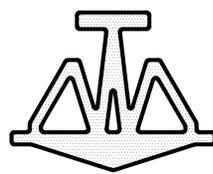


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Sheet:	10 of 23
Dwg. No.:	11349
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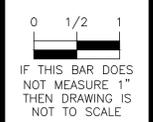
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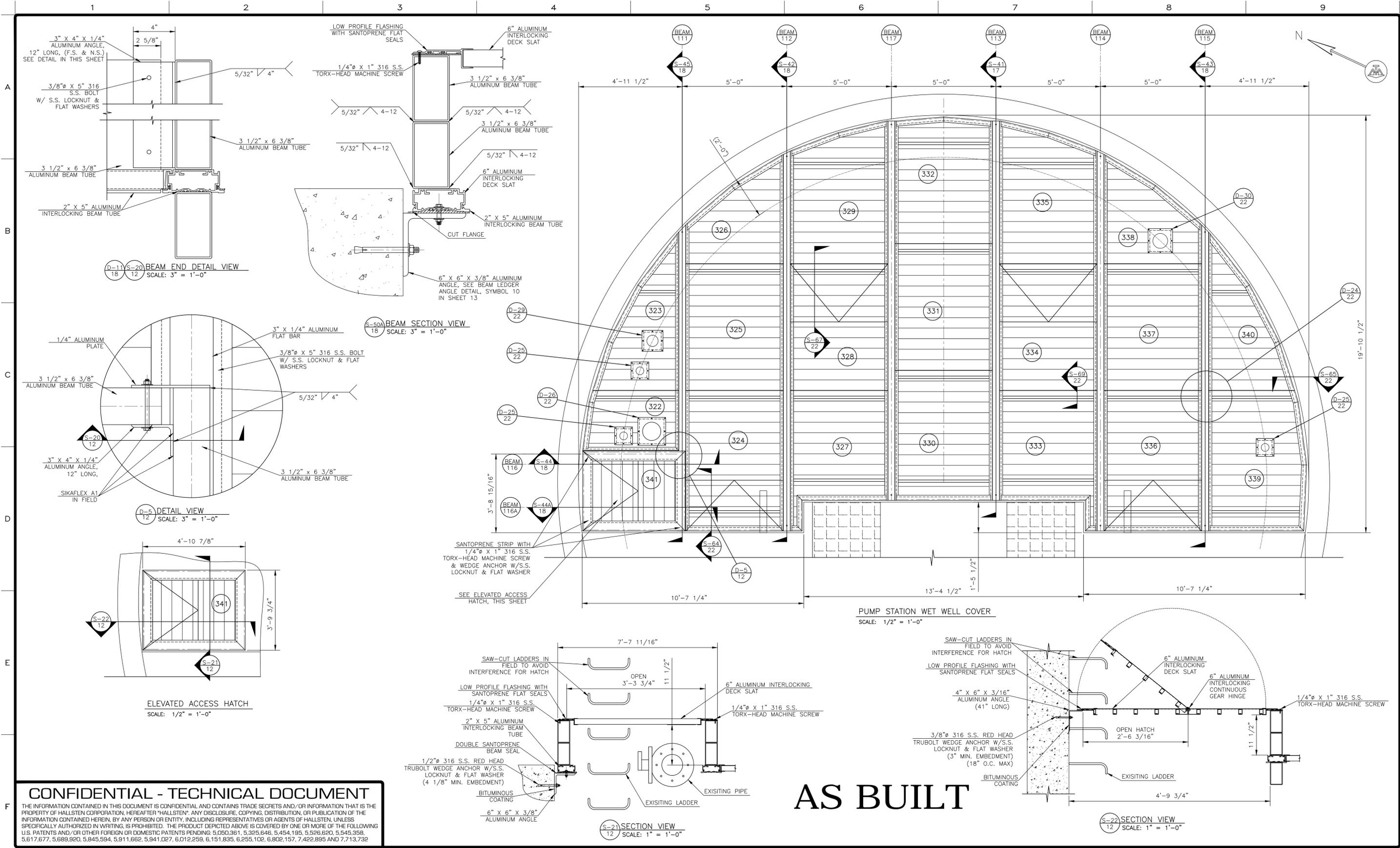
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ALUMINUM COVERS
WENATCHEE, WA

TRUSS SECTIONS & DETAILS

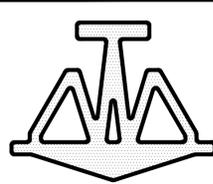


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Drawn By:	B. HILLENBURG
Sheet:	11 of 23
Dwg. No.:	11349
REVISIONS	
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3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH



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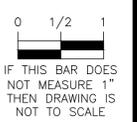
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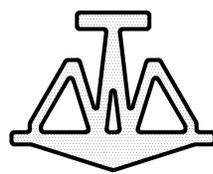
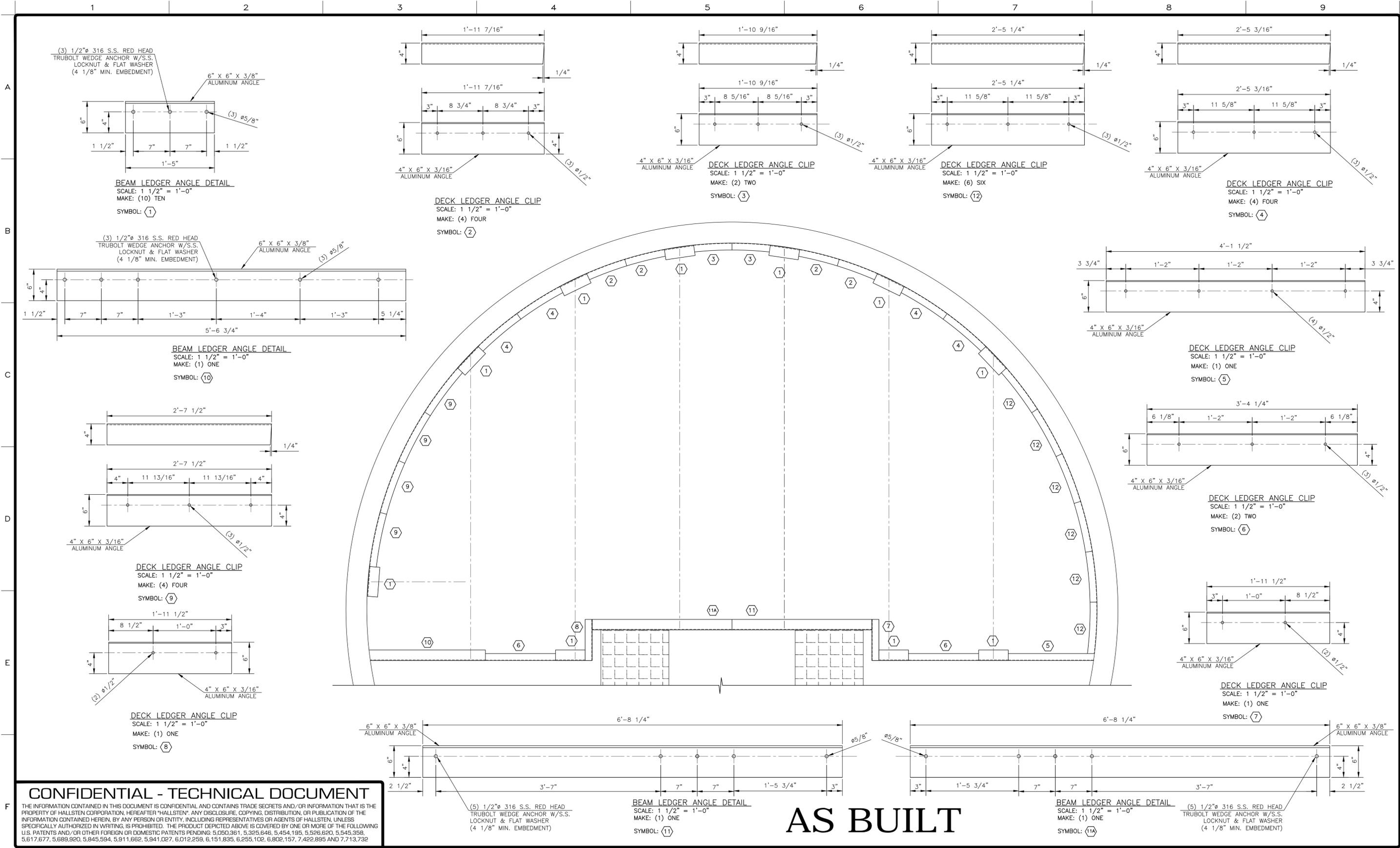
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ALUMINUM COVERS
WENATCHEE, WA

PUMP STATION WET WELL COVER LAYOUT PLAN VIEW



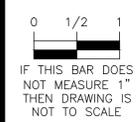
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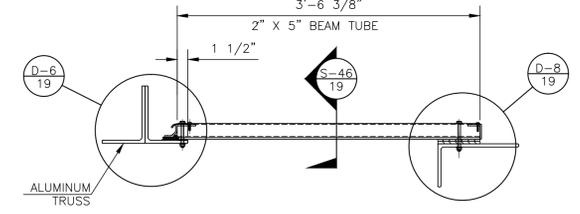
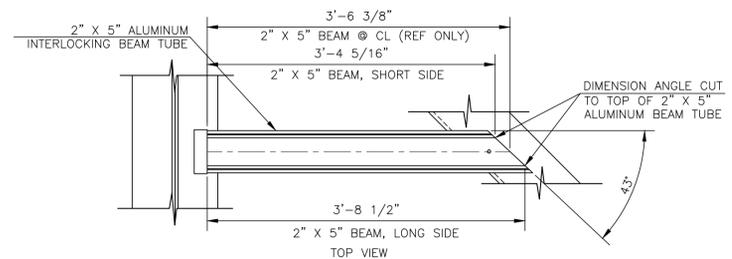
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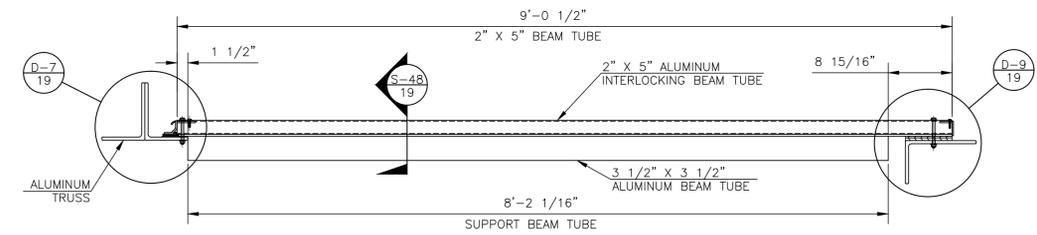
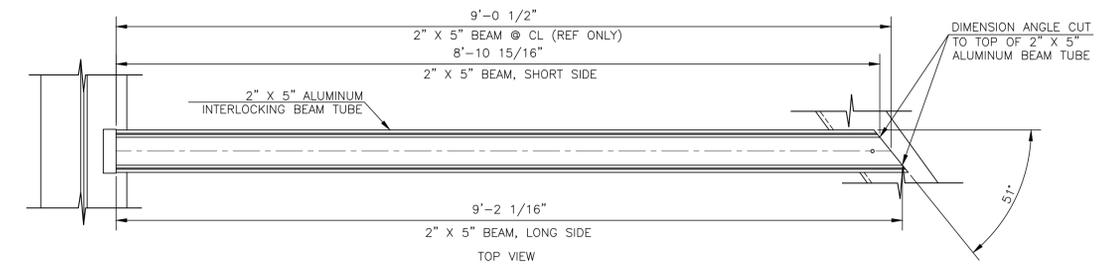
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PUMP STATION WET WELL LEDGER ANGLE LOCATION LAYOUT



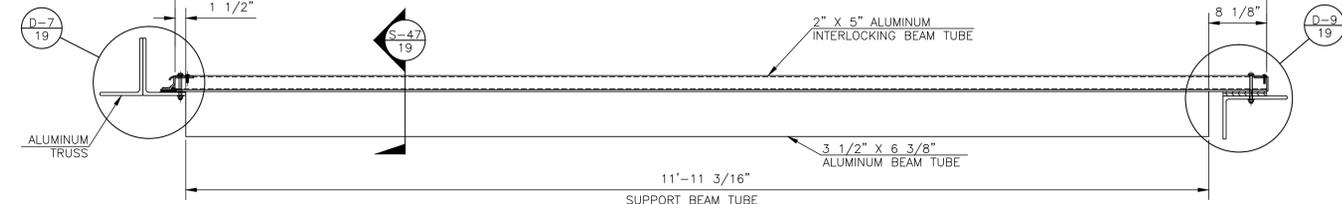
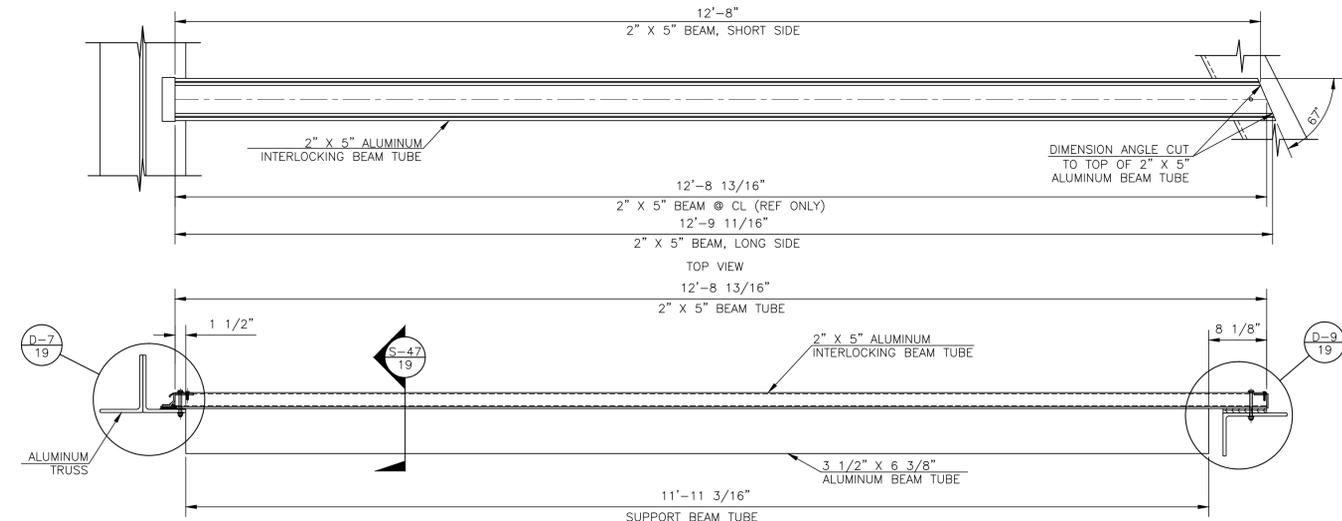
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Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	13 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH



S-23 BEAM #1, 11, 54 & 64 SECTION VIEW
 SCALE: 1" = 1'-0"
 MAKE (4) FOUR
 NOTE: BEAM #11 & 54 ARE OPPOSITE.



S-24 BEAM #2, 10, 55 & 63 SECTION VIEW
 SCALE: 1" = 1'-0"
 MAKE (4) FOUR
 NOTE: BEAM #10 & 55 ARE OPPOSITE.

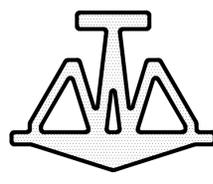


S-27 BEAM #3, 9, 56 & 62 SECTION VIEW
 SCALE: 1" = 1'-0"
 MAKE (4) FOUR
 NOTE: BEAM #9 & 56 ARE OPPOSITE.

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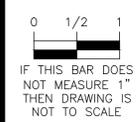
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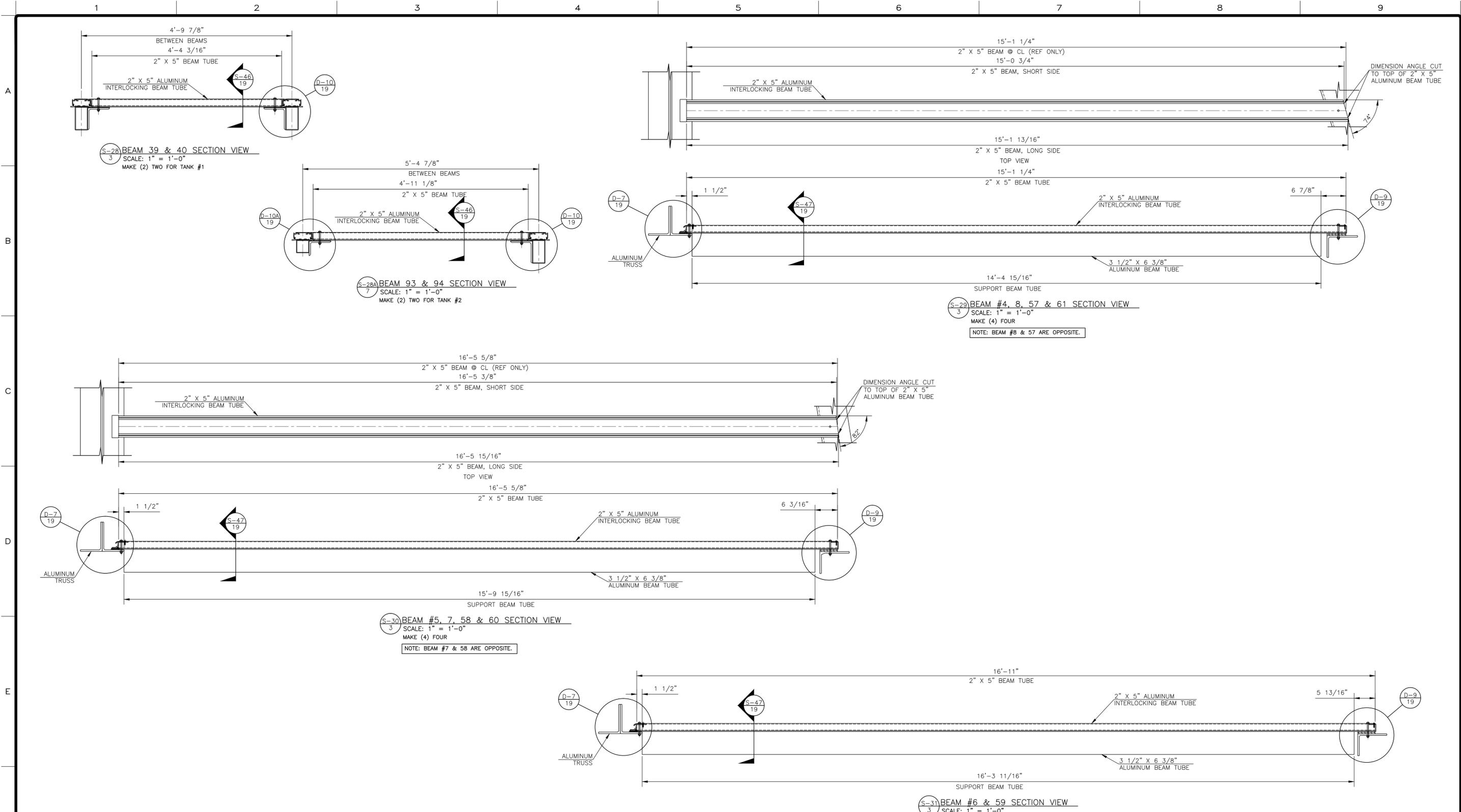
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BEAM SECTIONS



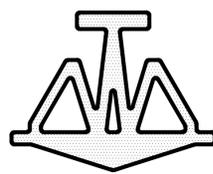
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Sheet:	14 of 23		
Dwg. No.:	11349		
REVISIONS			
4	12 SEP 12	BKH	
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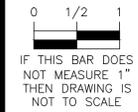
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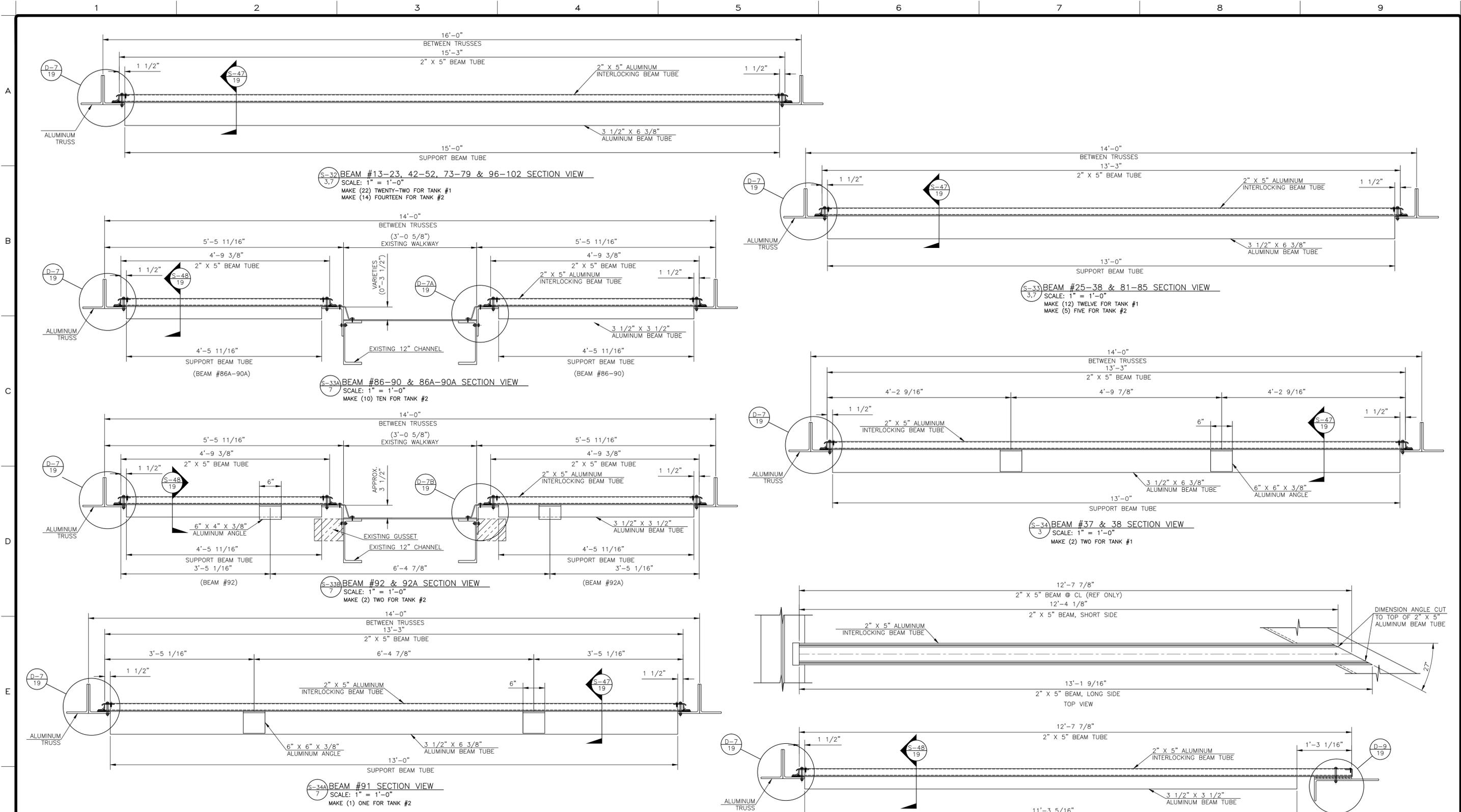
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ALUMINUM COVERS
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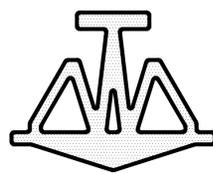
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Sheet:	15 of 23		
Dwg. No.:	11349		
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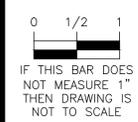
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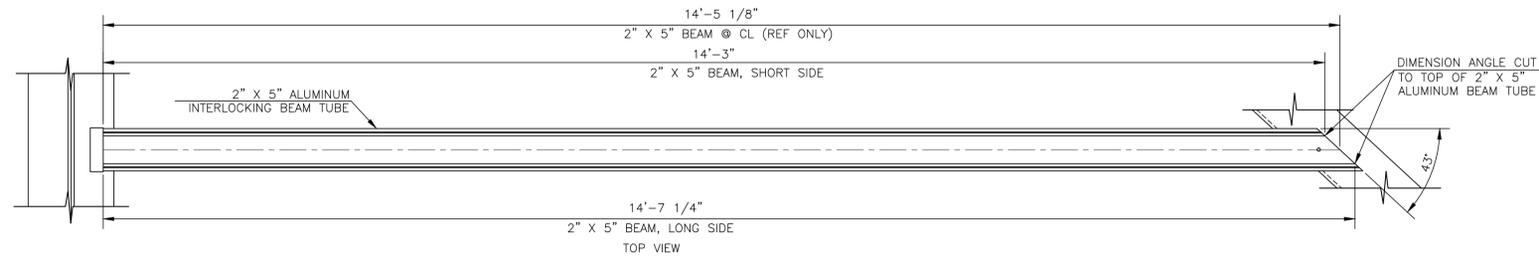
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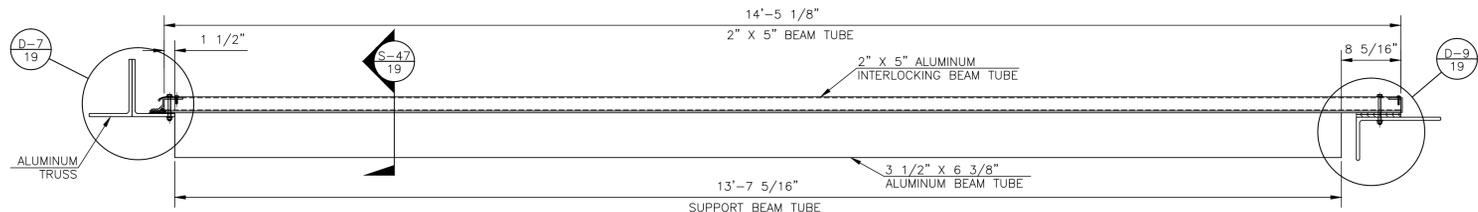


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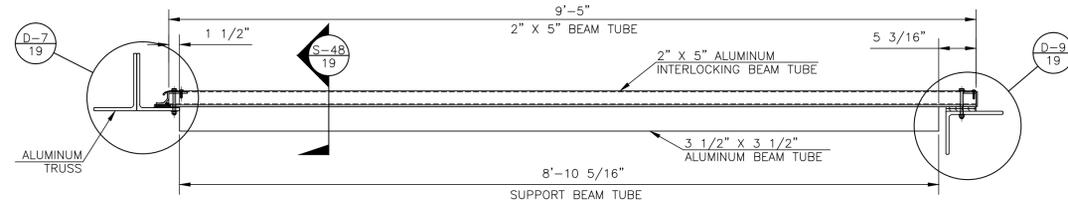
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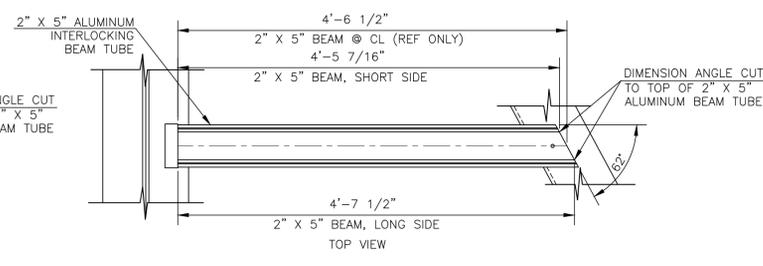
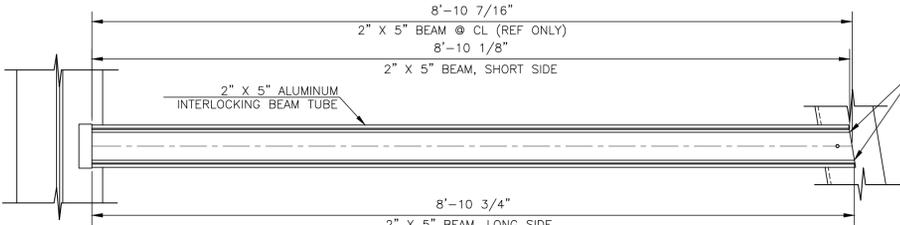
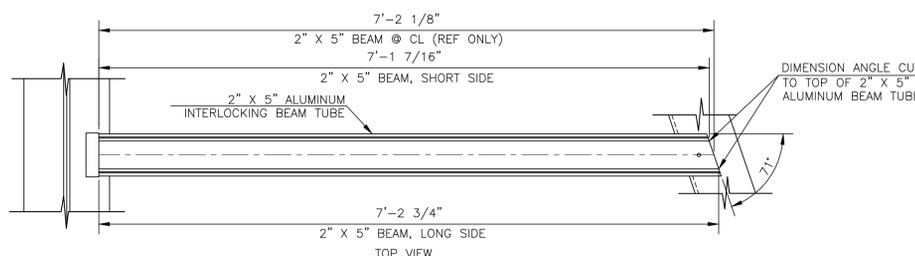


(S-36) BEAM #72, 80, 95 & 105 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (4) FOUR
NOTE: BEAM #24 & 41 ARE OPPOSITE.

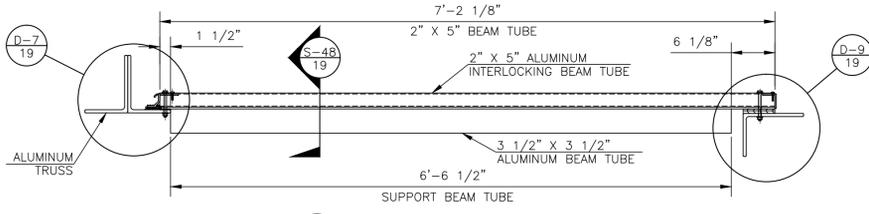


(S-37) BEAM #68 & 107 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (2) TWO

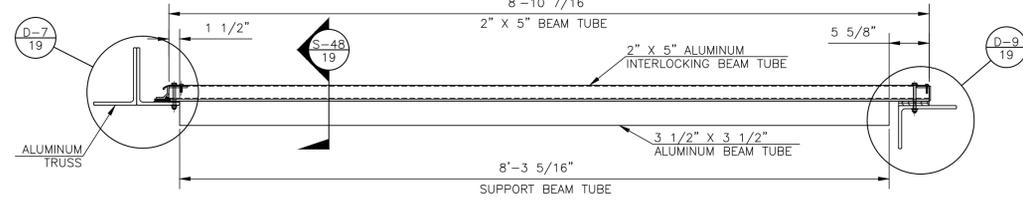
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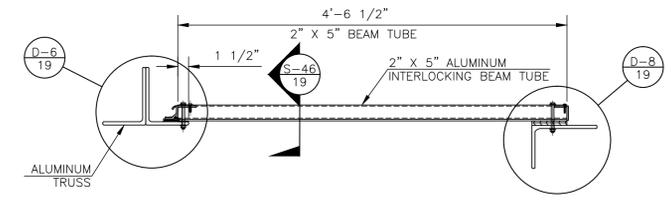
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(S-38) BEAM #66, 70, 105 & 109 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (4) FOUR
NOTE: BEAM #70 & 105 ARE OPPOSITE.

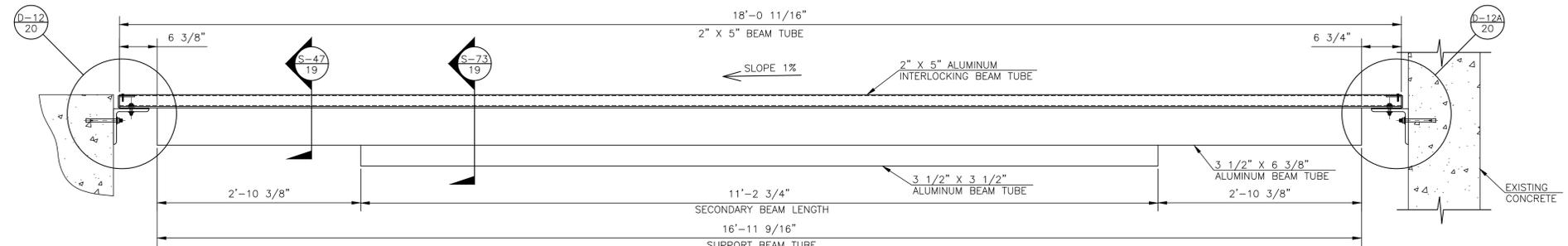


(S-39) BEAM #67, 69, 106 & 108 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (4) FOUR
NOTE: BEAM #69 & 106 ARE OPPOSITE.



(S-40) BEAM #65, 71, 104 & 110 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (4) FOUR
NOTE: BEAM #71 & 104 ARE OPPOSITE.

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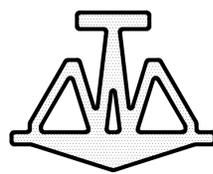


(S-41) BEAM 113 & 117 SECTION VIEW
SCALE: 1" = 1'-0"
MAKE (2) TWO

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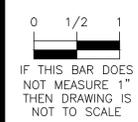
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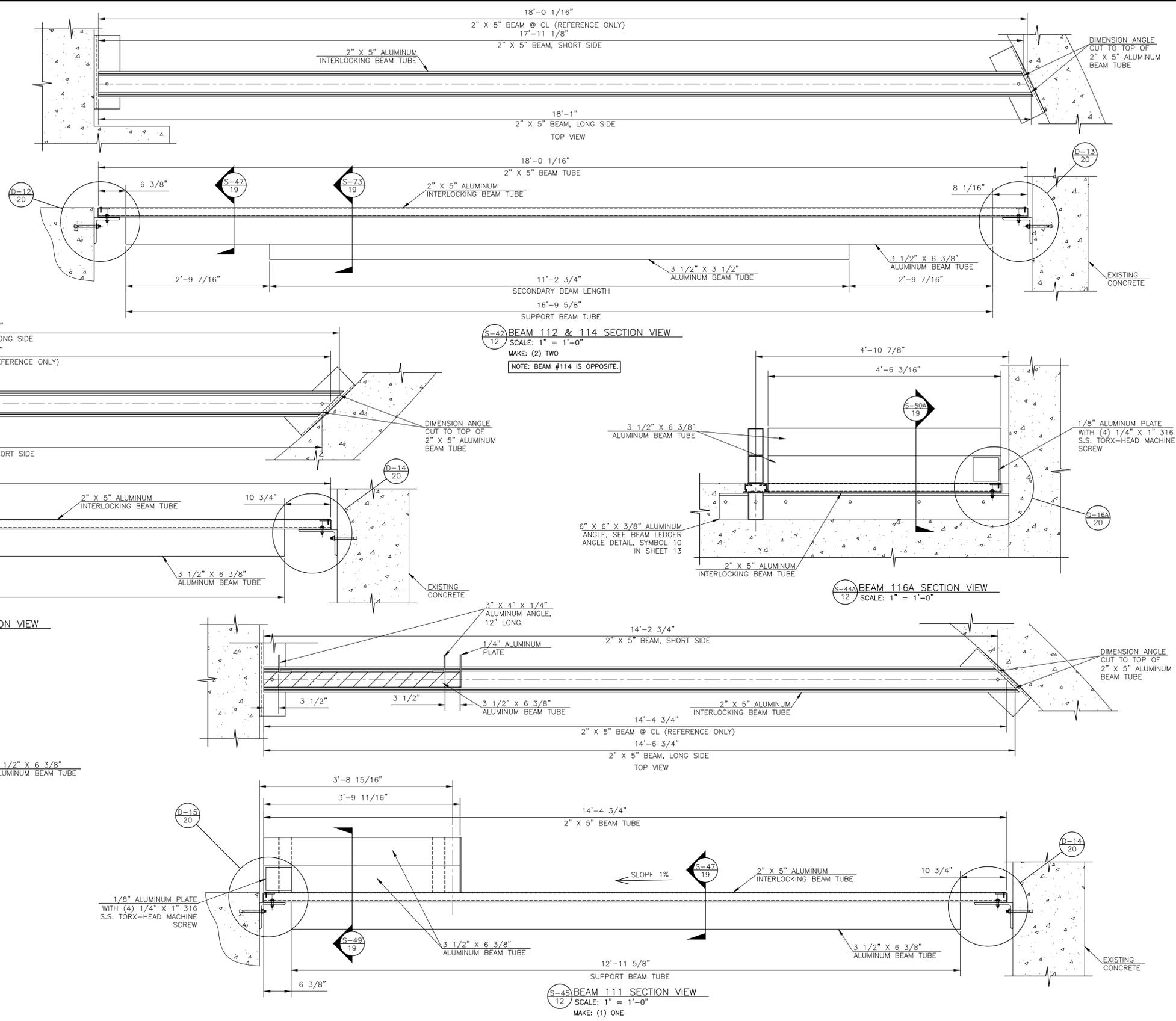
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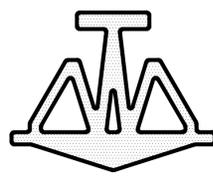
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Manager:	R. KUEHNE
Drawn By:	B. HILLENBURG
Sheet:	17 of 23
Dwg. No.:	11349
REVISIONS	
4	12 SEP 12 BKH
3	28 AUG 12 BKH
2	12 JUN 12 BKH
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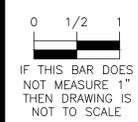
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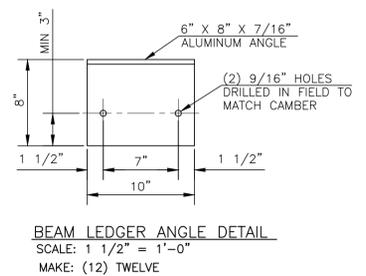
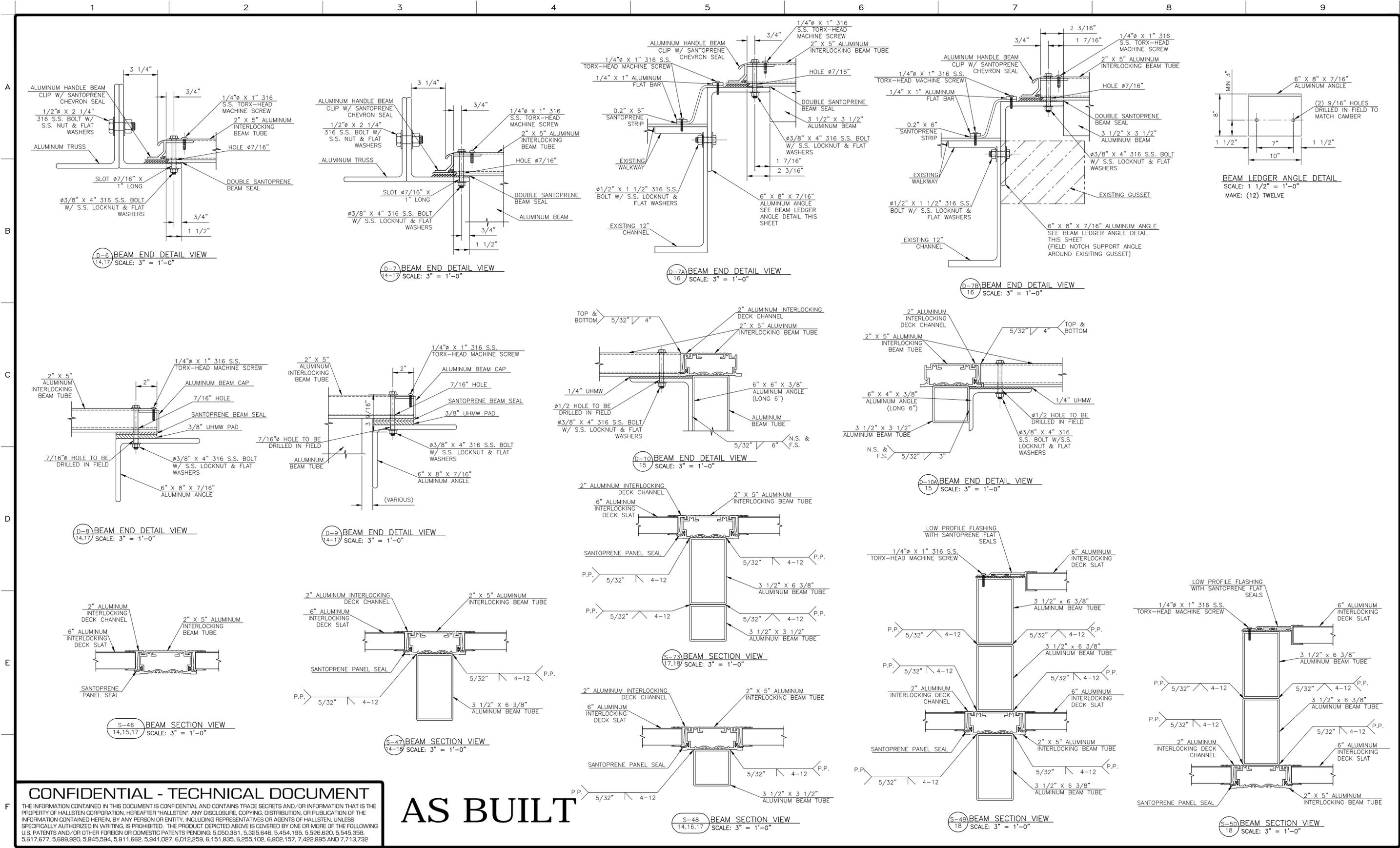
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ALUMINUM COVERS
 WENATCHEE, WA

BEAM SECTIONS



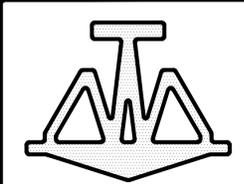
Date: 05 JAN 12			
Manager: R. KUEHNE			
Drawn By: B. HILLENBURG			
Sheet: 18 of 23			
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NO.	DATE	BY	REVISIONS
4	12 SEP 12	BKH	
3	28 AUG 12	BKH	
2	12 JUN 12	BKH	
1	23 MAY 12	BKH	



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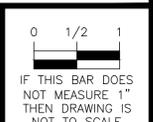
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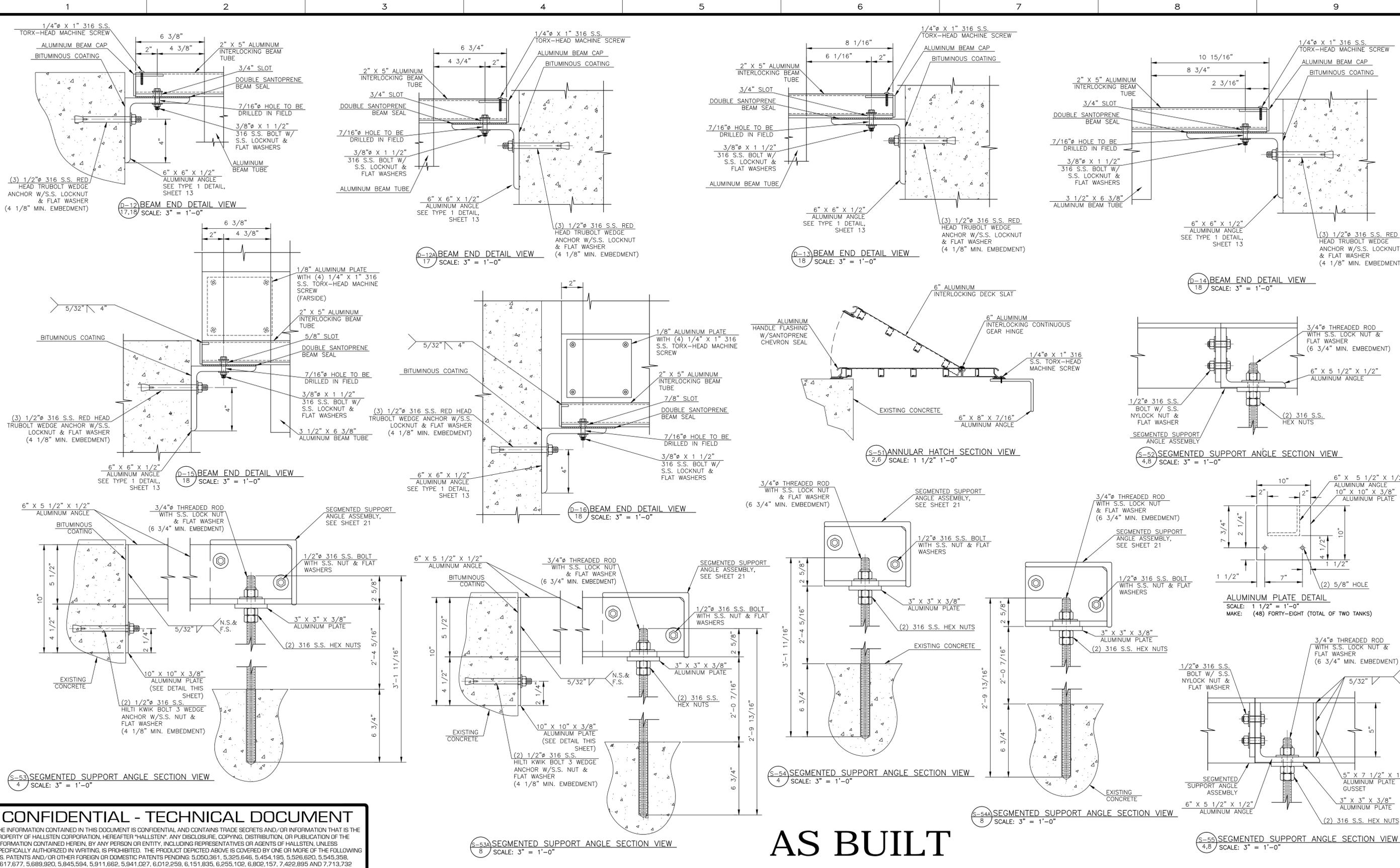
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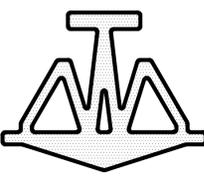
Date:	05 JAN 12	
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Drawn By:	B. HILLENBURG	
Sheet:	19 of 23	
Dwg. No.:	11349	
REVISIONS		
4	12 SEP 12	BKH
3	28 AUG 12	BKH
2	12 JUN 12	BKH
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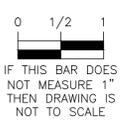
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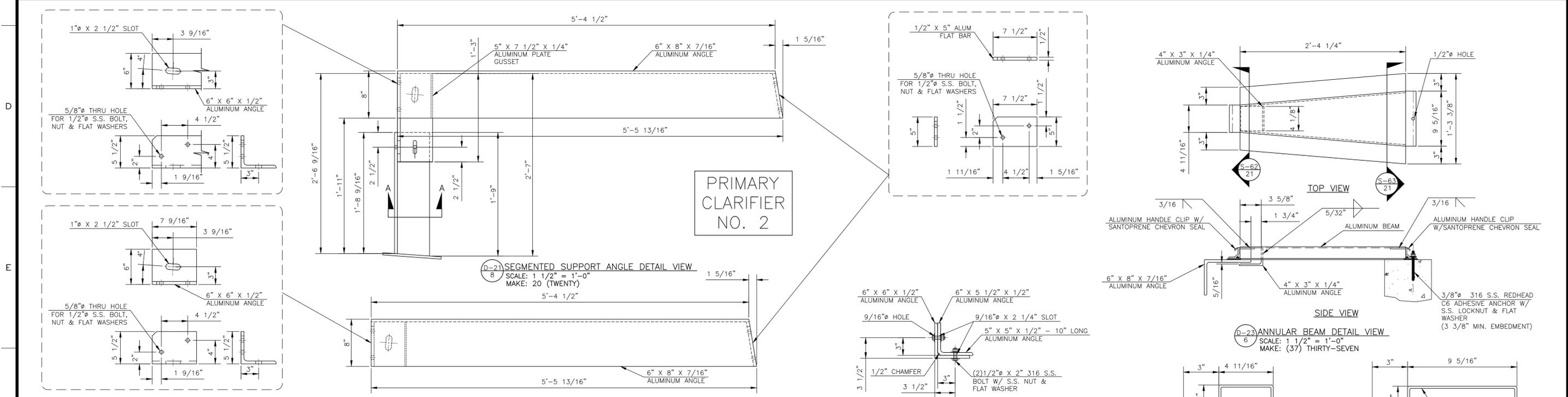
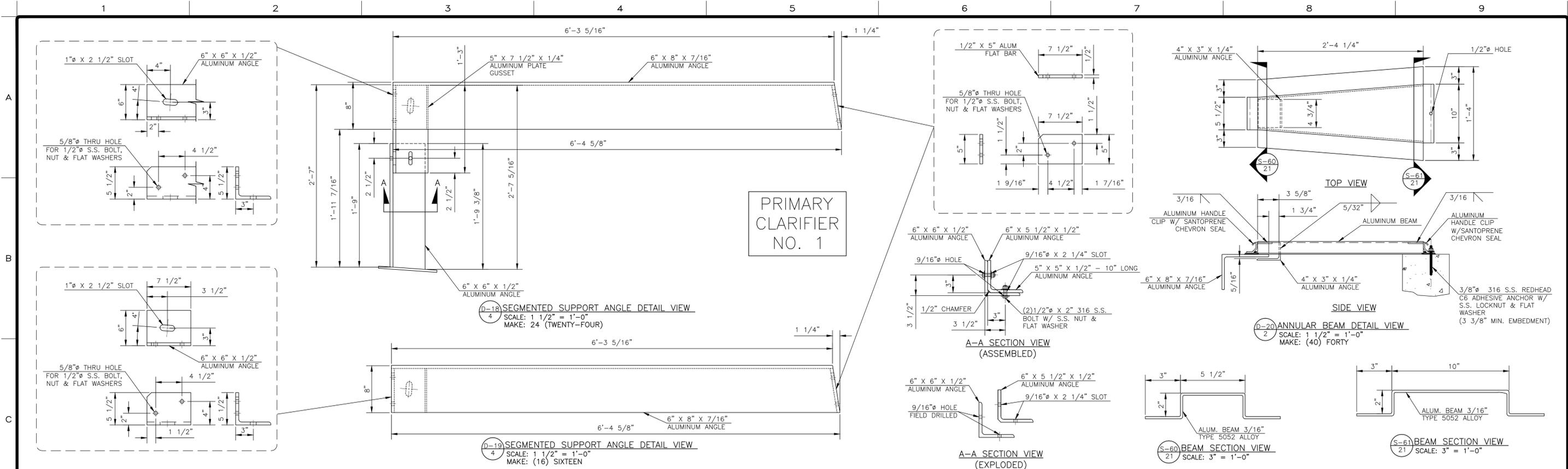
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ALUMINUM COVERS
 WENATCHEE, WA

DETAILS & SECTIONS



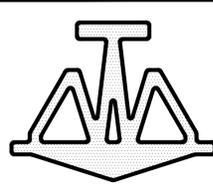
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Sheet: 20 of 23			
Dwg. No.: 11349			
4	12 SEP 12	BKH	
3	28 AUG 12	BKH	
2	12 JUN 12	BKH	
1	23 MAY 12	BKH	
REVISIONS			



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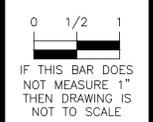
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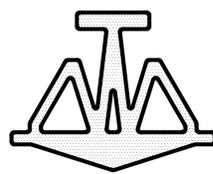
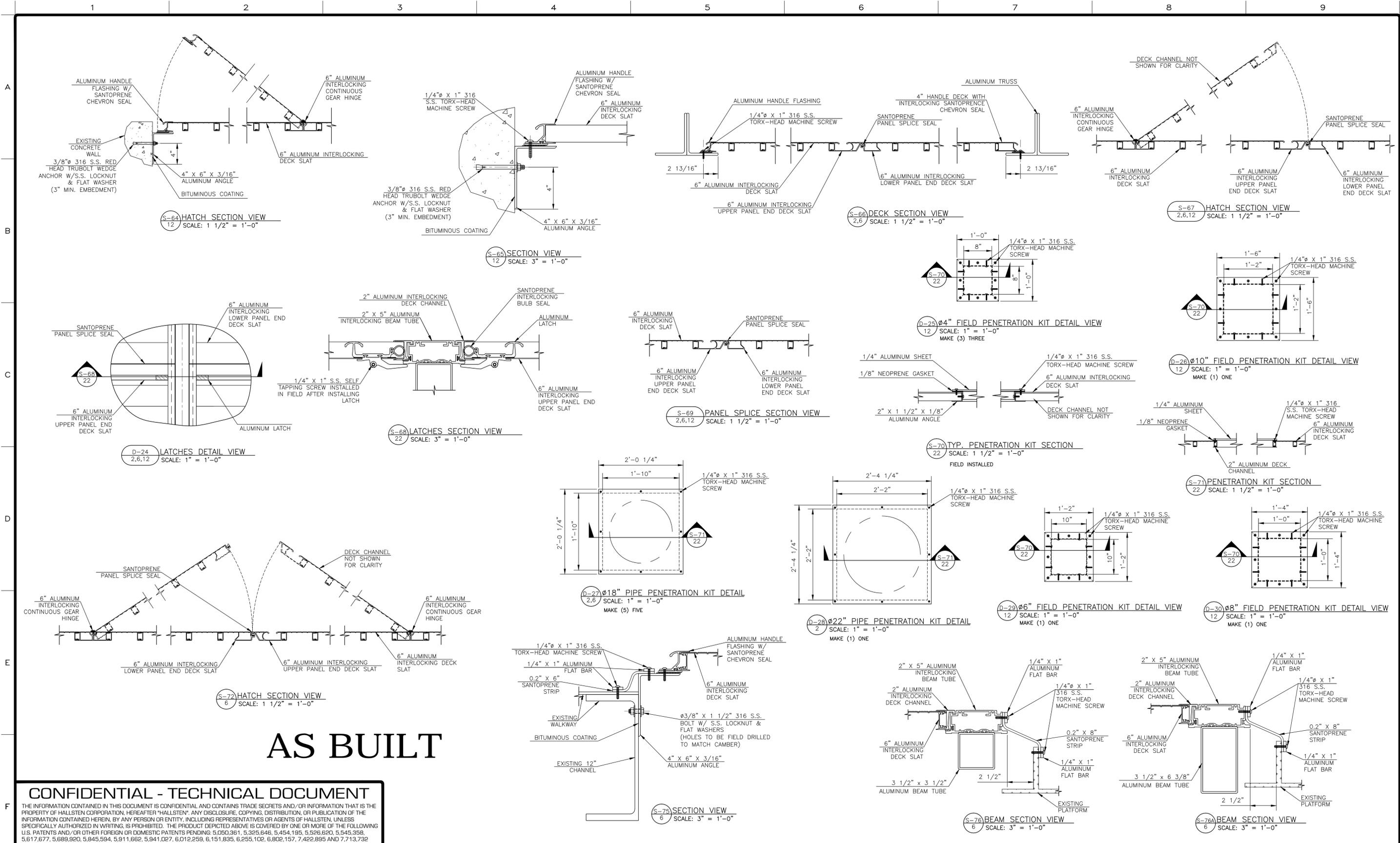
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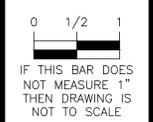
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Sheet: 21 of 23	
Dwg. No.: 11349	
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3	28 AUG 12 BKH
2	12 JUN 12 BKH
1	23 MAY 12 BKH
REVISIONS	



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Date: 05 JAN 12			
Manager: R. KUEHNE			
Drawn By: B. HILLENBURG			
Sheet: 22 of 23			
Dwg. No.: 11349			
4	12	SEP 12	BKH
3	28	AUG 12	BKH
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REVISIONS			

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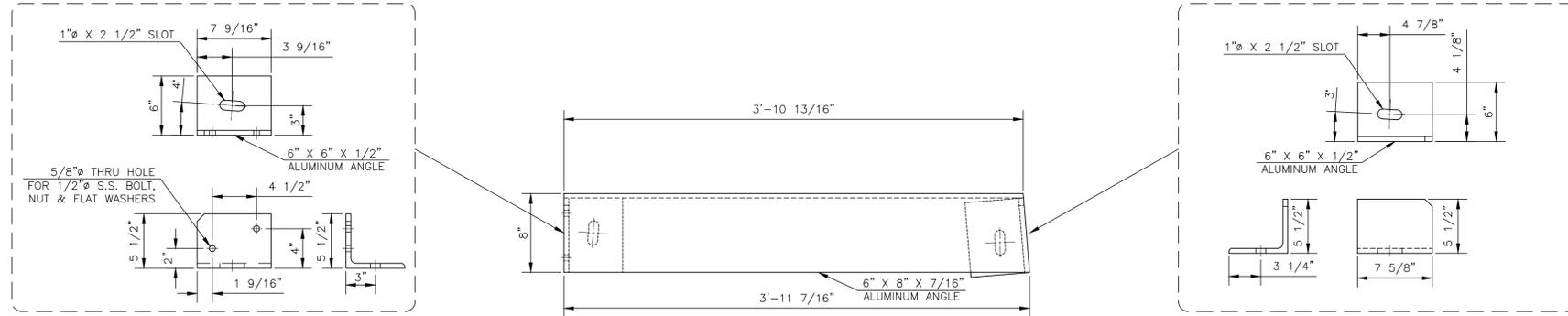
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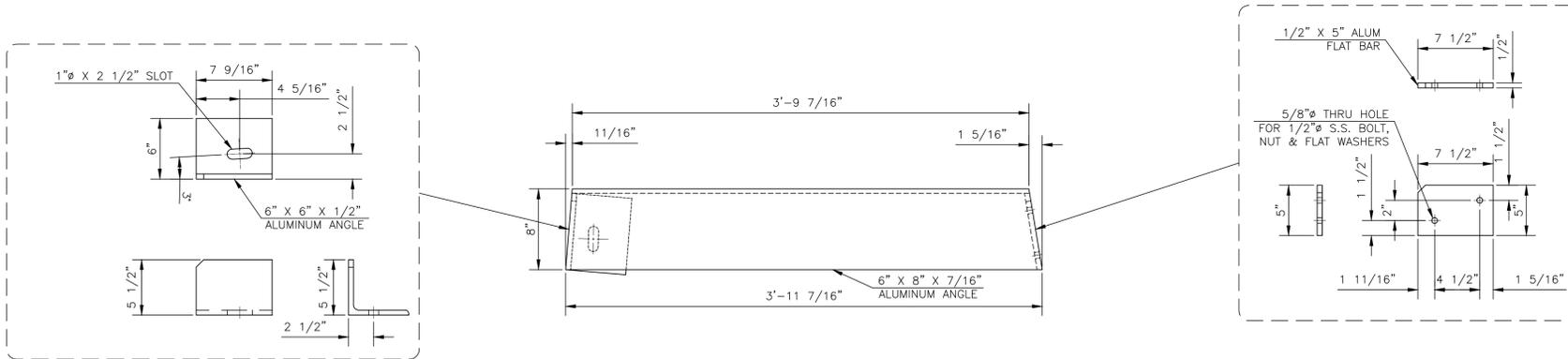
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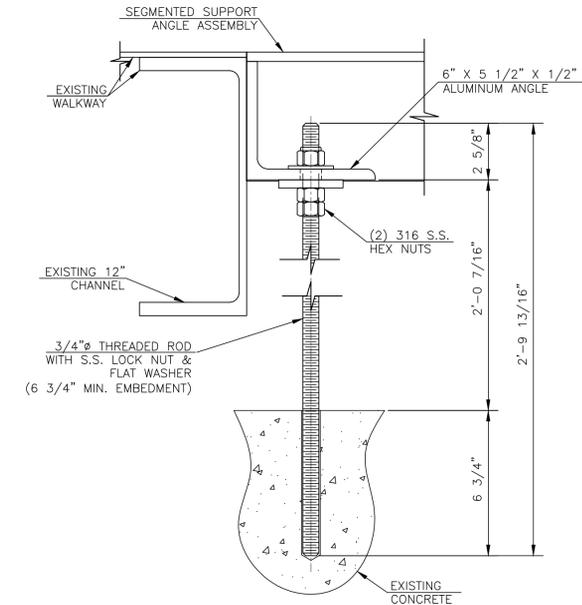
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(D-31) SEGMENTED SUPPORT ANGLE DETAIL VIEW
 SCALE: 1 1/2" = 1'-0"
 MAKE: (1) ONE



(D-32) SEGMENTED SUPPORT ANGLE DETAIL VIEW
 SCALE: 1 1/2" = 1'-0"
 MAKE: (1) ONE

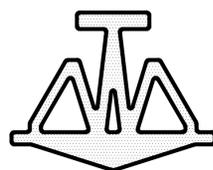


(S-77) SEGMENTED SUPPORT ANGLE SECTION VIEW
 SCALE: 3" = 1'-0"

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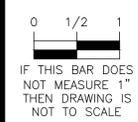
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