

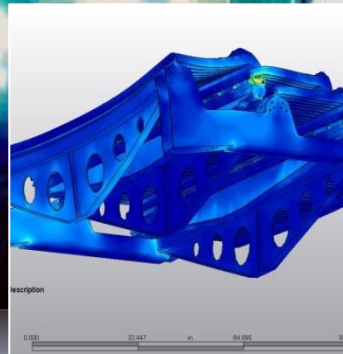
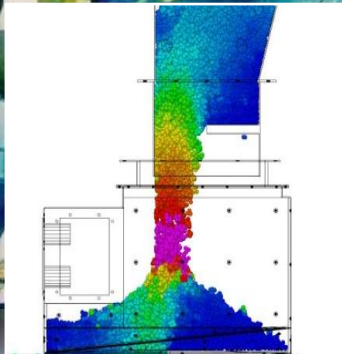
**PROVIDING COMPREHENSIVE
SOLUTIONS FOR ALL YOUR
MATERIAL HANDLING NEEDS**

DG MARSHALL ASSOCIATES

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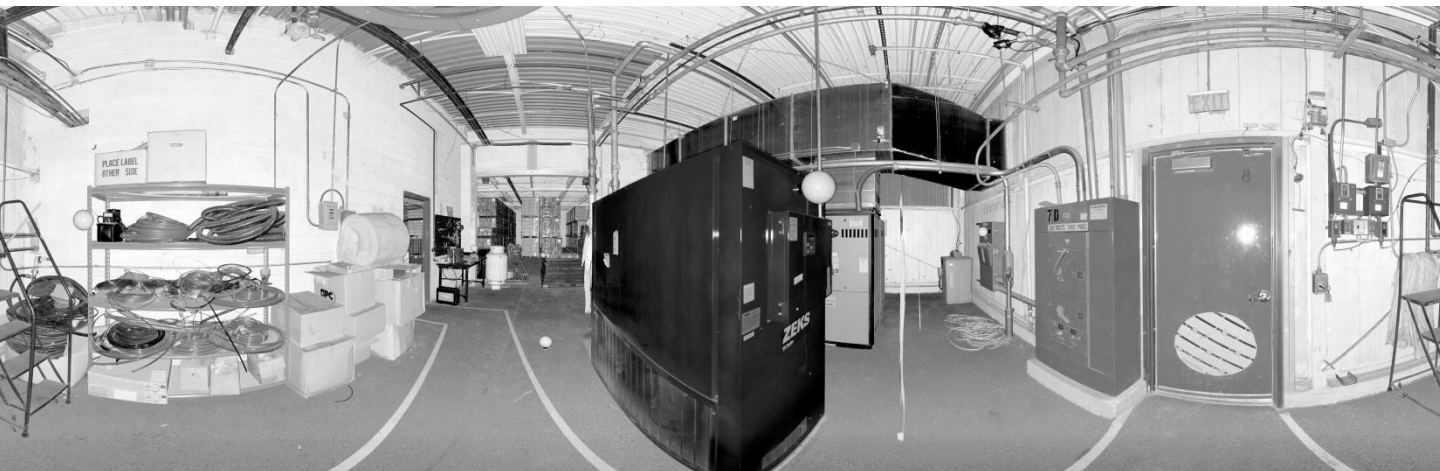
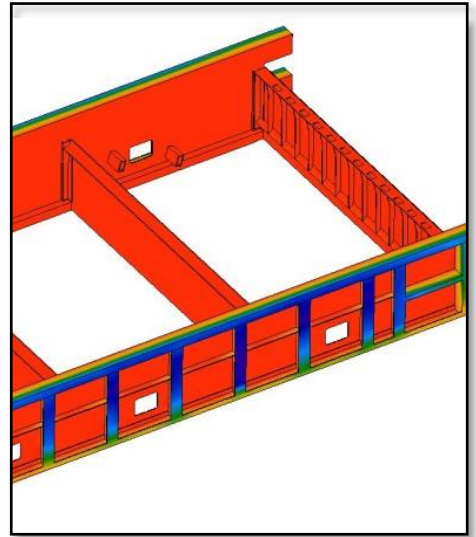
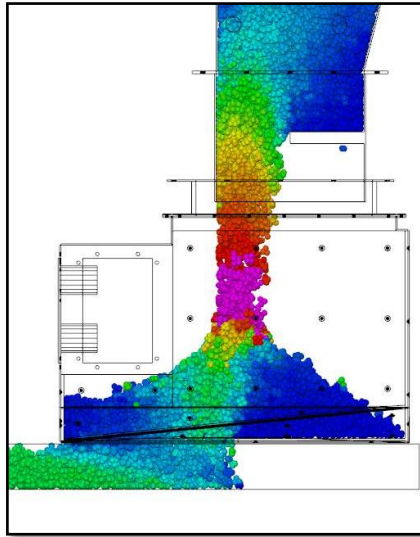
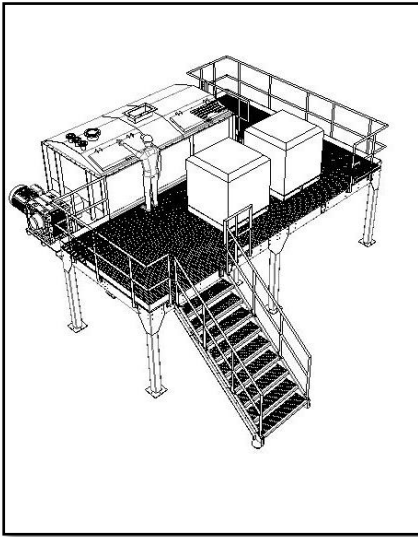
**2021 ENGINEERING
SERVICES CATALOG**

Engineering Capabilities

DG Marshall Associates relies on an experienced team of engineers, state of the art technology, and proven manufacturing standards to provide our customers with the most effective and economical solutions to fit their bulk material handling needs.

Engineering Services

- CAD Design
- DEM Flow Analysis
- FEA Structural Analysis
- Reality Capture
- Conveyor Design
- Drone Application Services



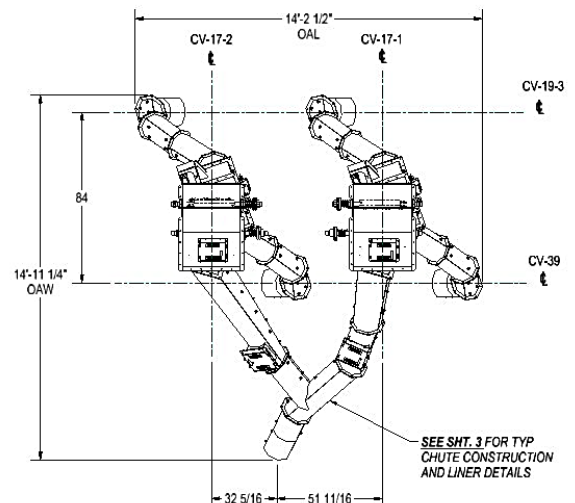
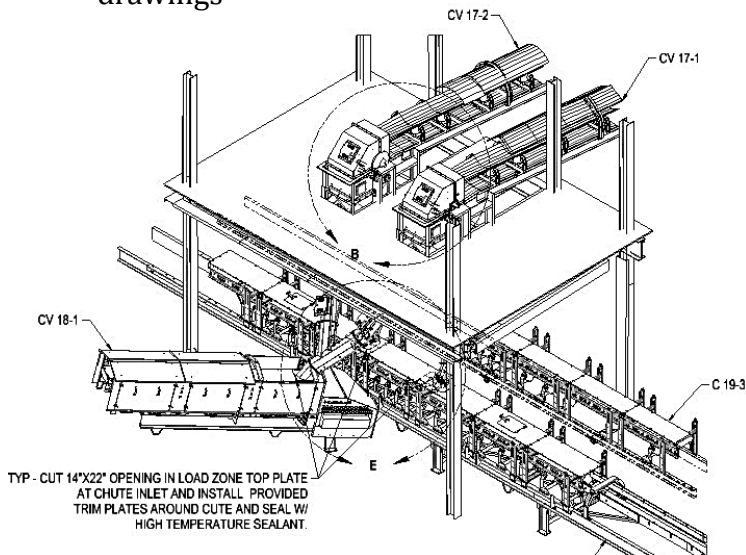
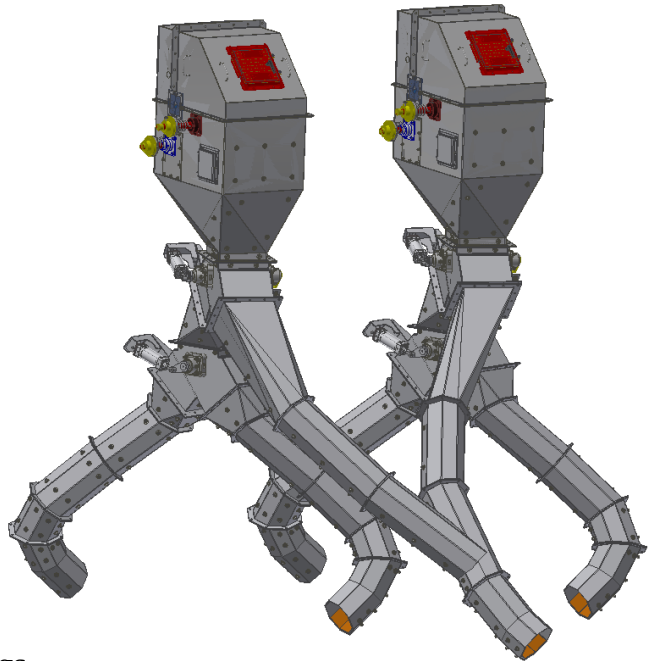
CAD Design

DG Marshall team of qualified engineers, CAD designers, managers, analysts, and draftsmen can work on your project collaboratively to create detailed 3D models for complex geometries, virtual renderings, animations, exploded/top-down assemblies, and manufacturing, assembly, and production drawings.

DG Marshall engineers design with industry leading Autodesk Product Design and Manufacturing suite which include Inventor, AutoCAD, Fusion 360, ReCap Pro, Navisworks Manage, Nastran, HSMWorks, Autodesk Rendering, and Autodesk Plant.

CAD Design Services

- CAD Drafting & CAD Drawing
- CAM Design and Drafting services
- 3D Rendering and Visualization
- 3D Modeling
- 3D Computer Animation
- Product Designing
- Legacy Conversion
- Drafting Services for Manufacturing, Assembly, and Production Layouts
- Exploded and Top-down Assembly Drawings
- Conversion of 2D Drawings to 3D Models and Drawings
- Remodeling, resizing, and scaling of legacy drawings

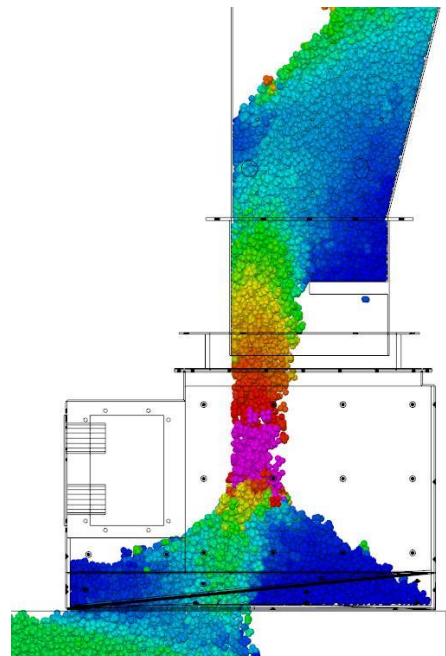
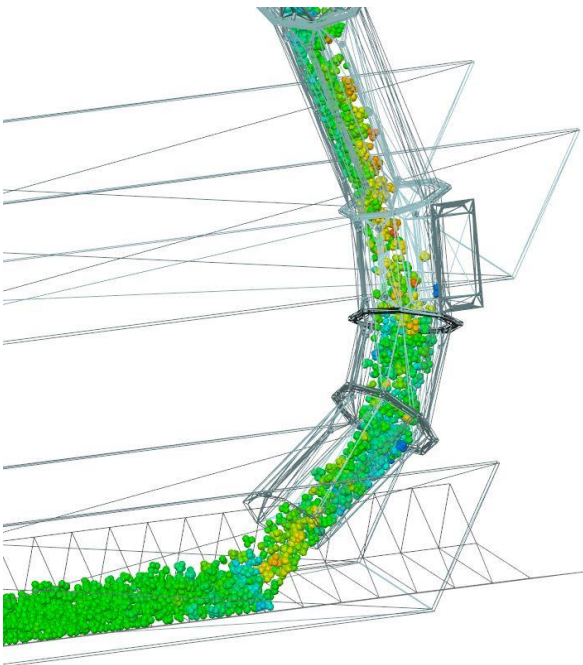
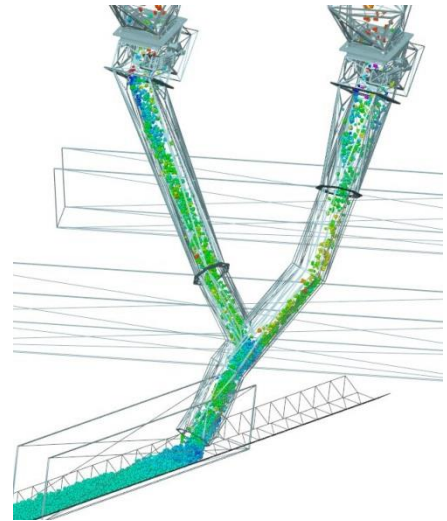


DEM Flow Analysis

DG Marshall's Discrete Element Method (DEM) simulation package can be used to quickly and accurately model three-dimensional behavior of granular flow in a wide range of material properties including wet, sticky, and cohesive materials. DEM can provide a clear understanding of material degradation, surface wear, impact damage, energy dissipation, and other fundamental parameters. By predicting the wear on transfer chute liners, conveyor belts, and other surfaces allows the ability to qualitatively compare multiple transfer chute designs and select the optimal geometry that minimizes wear, dust generation, and material abrasion.

Benefits of DEM

- Visualize material flow
- Determine bulk material flow patterns and rates
- Analyze impact forces and wear patterns on boundary surfaces
- Regulate velocity profiles and dead zones
- Optimize chute designs and transfer points

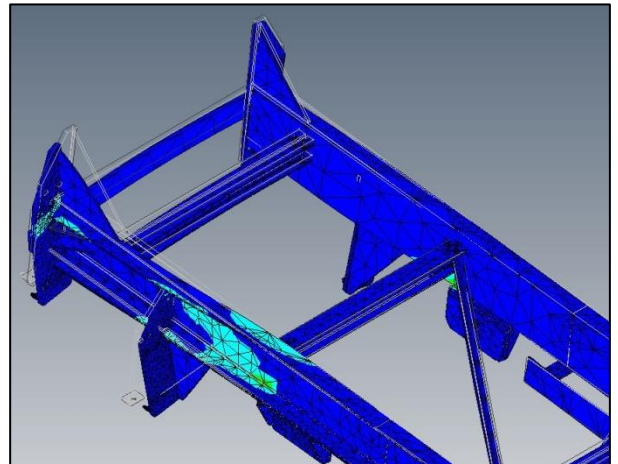
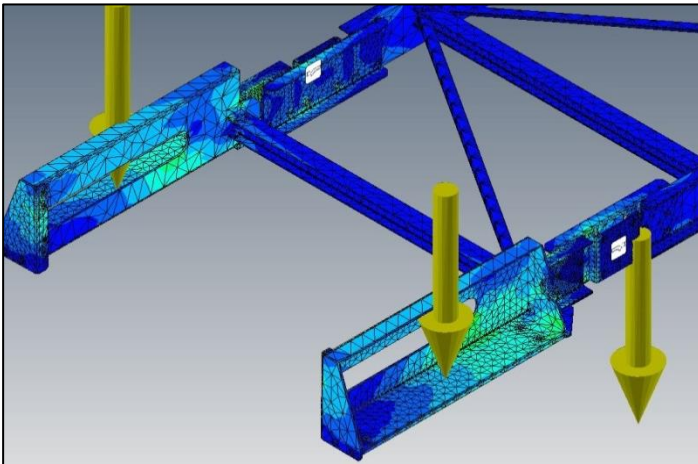
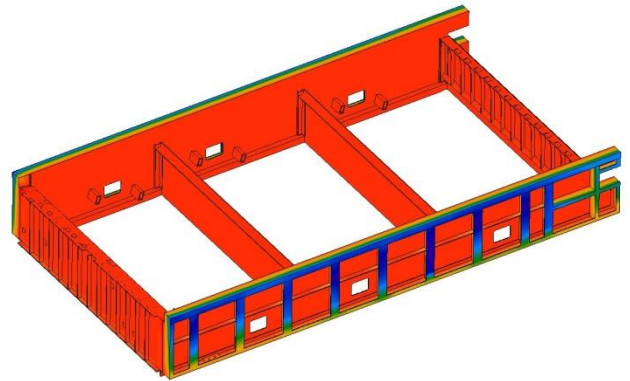


FEA Analysis

DG Marshall utilizes Finite Element Analysis (FEA) to evaluate complex geometries for systems and structures to accurately predict the equipment's responses when subject to mechanical forces and vibrations. The reactions are gauged against acceptable defined limits for stresses and deflections allowing for verification of structural integrity and optimizing designs.

Benefits of FEA Analysis:

- Verify deflections and stresses at key interfaces
- Confirm structural integrity of the equipment and/or system
- Determine reaction loads and pressure points of equipment at landings.
- Streamline designs for economy and function.



Reality Capture

DG Marshall's 3D Scanning capabilities provides data and information to a project aiding visualization, design, and analysis. The 3D Point Cloud data allows the user to accurately measure and capture complex geometries at existing sites and facilities. The scanning technology provides the ability to capture a location in real time and import it into a CAD software to determine existing conditions and design within the generated environment.

Uses for 3D Laser Scanning:

- Provide as-built documentation
- Design engineering for facility upgrades and expansions
- Prefabrication construction verification and interference detection
- Creating multiple layouts and configurations for existing and new process lines

Benefits of 3D Laser Scanning

- **Fast:** Gather measurements of entire facilities in hours instead of days
- **Accurate:** Scans are highly accurate up to +/- 3mm
- **Cost Reducing:** The various uses ultimately leads to minimizing or eliminating downtime for both the design and installation of the systems



Conveyor Design

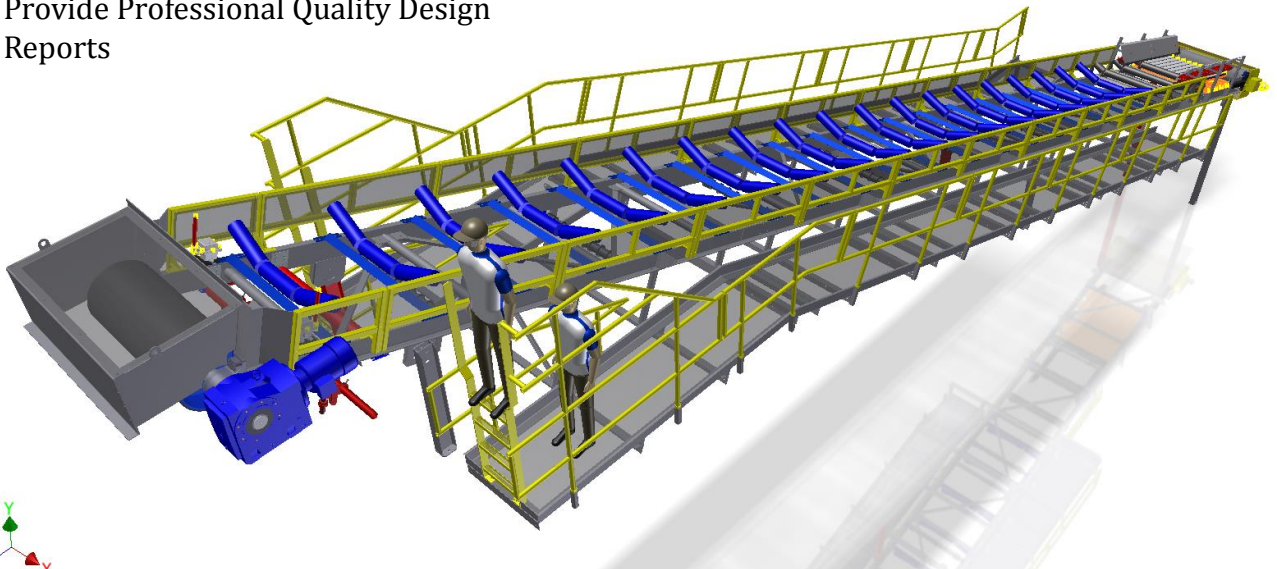
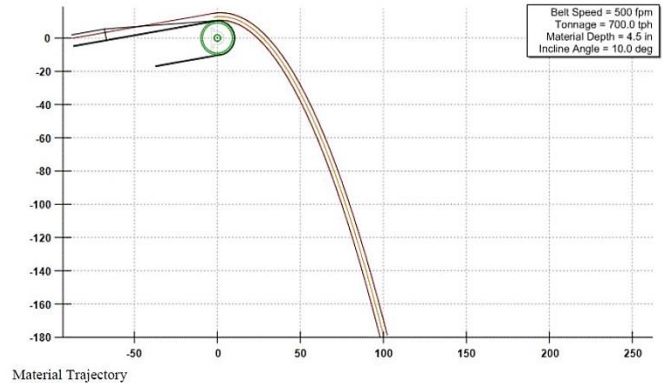
DG Marshall's years of conveyor design experience combined with our comprehensive analytical tools allows us to optimize your conveyor design in order to prove a safe, reliable, and economical system. Our experience and software allows us to model conveyors of any geometry, length, and drive configuration as well as analysis of vertical and horizontal curves, transition stress and demands, sizing and calculations of components.

Benefits of Conveyor Design and Sidewinder

- Design a Wide Variety of Conveyor Geometries and Operating Conditions
- Apply Multiple Material Types & Byway Conveying
- Determine the Dynamics of Starting / Stopping / Emergency Stopping
- Analyze Belting and Belt Stresses
- Properly Size Pulley Shaft & Bearings
- Simulate Material Load On / Load Off
- Utilize Right Angle Drives with Overhung Loads
- Employ Custom Idler Types
- Provide Professional Quality Design Reports

Material Trajectory

The image below shows the material trajectory for the fully loaded normal friction case.



Drone Application Services

With an in-house FAA licensed pilot, our drone application services offer aerial video, building and property surveying, and photogrammetry services to expand the visualization and analysis of a facility. We utilize drones equipped with cameras that capture HD videos HD photos. Through this service, we can combine photogrammetry technology with our reality capture to create dimensionally accurate aerial photographs.

Benefits of Drone Service

- Site Planning and Progress Tracking
- Conducting Aerial Site Surveys
- Stockpile Reports
- Quality and Inspection Services
- Site Mapping
- Marketing Media



WHO WE ARE

DG Marshall Associates, Inc. is a family owned company specializing in the design and manufacturing of all types of conveyors and material handling systems.

With over 75 years of combined experience designing and building a wide variety of bulk material handling projects, DG Marshall has established itself as a leader and innovator in the industry. Our unique ability to design and build to our customers' specific material handling needs separates us from the competition.

We work closely with clients to evaluate production processes and offer solutions to increase efficiency and productivity. At DG Marshall, our goal is to form lasting relationships with our customers and to provide comprehensive solutions for any material handling needs.

WHAT WE DO

We are a full-service company, with the capability of designing and building complete, integrated systems as well as individual components.

Our sales staff and project managers work together with customers to determine the best fit for their application. Onsite point cloud laser scanning of facilities and equipment is available to ensure seamless integration with existing structures and processes. From there, our engineering department uses state-of-the-art 3D modeling and FEA analysis software to design the equipment. An experienced team of fabricators and assemblers then builds the equipment to the exact specifications.

Our products include all types of conveyors (belt, drag, screw, etc.), bucket elevators, blenders, storage bins and all periphery types of products (mezzanines, walkways, galleries, ladders, etc.). We service a broad spectrum of industries from recycling and waste to energy, to bulk powders and wastewater.

QUALITY & SERVICE

All of our products are constructed using only the highest quality materials and components. Each unit is built according to strict specifications and is inspected and test run prior to shipment to ensure seamless installation and integration in the field.

Our goal is to offer the best, most reliable equipment to our customers at an affordable price. We also offer a complete line of after sales spare parts and services.

DG Marshall Associates
Inc.
Designers & Builders Of Conveying Systems

CONTACT US

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