



BIM SERVICES FOR MECHANICAL DESIGN AND CONSTRUCTION



ABOUT ROOTS BIM

Years of experience

Roots BIM LLC is a Chicago-based BIM consultation and design assistance firm. With over 30 years in the construction industry, our team brings over 60 years of collective experience in Virtual Design and Construction across North America, UK, and the Middle East.

Specialization

At Roots BIM, we provide a wide range of Virtual Design and Construction (VDC) services tailored to Architects, Engineering firms, and Contractors, combining industry expertise with a deep understanding of engineering consulting and contracting. Our comprehensive suite of BIM services streamline AEC projects, from 3D modeling to construction management.



OUR SERVICES FOR MECHANICAL DESIGN AND CONSTRUCTION

KEY SERVICES

01

BIM for General Contractors (GC)

Roots BIM offers general contractors a one-stop shop for all their BIM needs, from creating 3D models and clash detection for construction to managing the project schedule with BIM software. Their services encompass everything from pre-construction planning to on-site collaboration, ensuring a smoother workflow throughout the entire building process.

02

BIM for Mechanical HVAC, Piping & Plumbing

Mechanical and plumbing contractors leverage Roots BIM's expertise to create accurate 3D models for MEP systems (accurate piping, ductwork layouts), enabling clash detection, prefabrication, and precise quantity takeoffs, leading to smoother installations and reduced costs.

03

BIM for Electrical

Electrical contractors benefit from Roots BIM's precise 3D modeling of electrical systems, enabling clash detection, efficient cable tray layout planning, load analysis, prefabrication and the generation of shop drawings for streamlined electrical installation and optimized electrical design.

04

BIM for Fire Protection

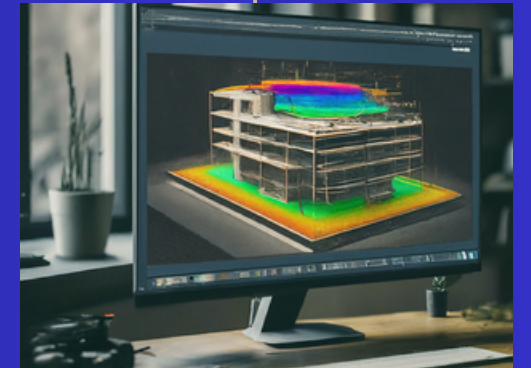
Fire protection contractors using Roots BIM gain access to intelligent 3D modeling for sprinkler system design and smoke control, clash detection with other building systems, and code compliance analysis, leading to a safer and more efficient fire protection plan. BIM facilitates fire simulations and egress analysis, optimizing fire protection strategies for occupant safety.



BIM FOR GENERAL CONTRACTORS

3D Modeling, Constructability Reviews, Clash Detection, Shop Drawing Creation, Construction Management

- We create 3D models for better visualization and clash detection to avoid on-site issues, and improved constructability. We detect constructability issues related to operation, code, design discrepancy and input inconsistencies and generate accurate and reliable shop drawings through our coordinated 3D BIM models.
- Our BIM Engineers create real-time simulation of the construction sequence with 4D BIM to compare the “Planned vs Actual” schedule throughout the project’s life cycle.
- Through 5D BIM, we simulate the increase in cost as the project evolves with time.



BIM Documentation Audit, Quantity Take-Off

- We review CD and DD sets to check for errors, omissions, and data mismatches.
- We audit BIM models to ensure accuracy and reliability of CD sets, shop drawings, and Quantity Take-Off generated from the model.
- We develop precise material quantities, generated from coordinated 3D BIM models to provide reliable cost estimates for procurement and installation.



Marketing Bid Presentation, Scan to BIM, Facility Management

- We create accurate and effective marketing presentations with 3D rendered images, 4D phasing, site logistics, and walkthrough animations to help clients secure competitive bids.
- We provide Scan-To-BIM services including Progress Monitoring, Quantity Estimation, Inspections & Approvals, and Construction Quality Management. Our data-rich 3D models include information like warranties, equipment lists, etc for facility management.



BIM FOR MECHANICAL & PLUMBING

Constructability Review

- **Through constructability review, we determine the accuracy & reliability of construction documents for seamless construction.**

Pre-Bid Estimation

- **We generate estimates using leading software tools to deliver:**
 - Accurate length & size of ducts and pipes**
 - Total fittings, accessories & equipment**
 - Quantity and cost of material**
 - Labor cost (fabrication, installation & others)**
 - Material and material cost**
 - Linear and wrap cost**

Value Engineering

- **We optimize design to reduce construction costs, shorten the installation time, and improve system efficiency & project lifecycle costs.**

3D Modeling and Clash Detection

- **We generate accurate 3D MEP BIM models from a wide range of inputs, such as Design & Contract Documents and project specification sheets.**
- **We resolve inter-trade clashes to ensure model accuracy.**

Shop Drawings and Quantity Take-offs

Our comprehensive shop drawings facilitate fabrication and site installation, generated automatically from the 3D model.

Different Types of Shop Drawings include:

- **Floor plan layout – Plan view of a particular area**
- **CSD / Overlay Drawing – Combined services drawings, including drawings of all trades**
- **Section Drawing – Sectional view of a particular area**
- **Details Drawings – Sectional, plan, or isometric view with a detailed description of an area**
- **Riser Drawings – Equipment or fixture connections diagram floor by floor**
- **Penetration Drawing – Plan view with detailed information of sleeve and cut-outs for wall and slab**
- **Insert Drawings – Plan view with field locations / coordinate points for hanger rod/insert**
- **Spool / CAM – Detailed drawings of pipes, ducts, and associated components of a particular part/network for fabrication**
- **Equipment Pad / Plinth Layout – Plan view with location and specification of equipment base/pad**
- **As-Built Drawings – Diagram of services (model, shop drawing) as per field installation**

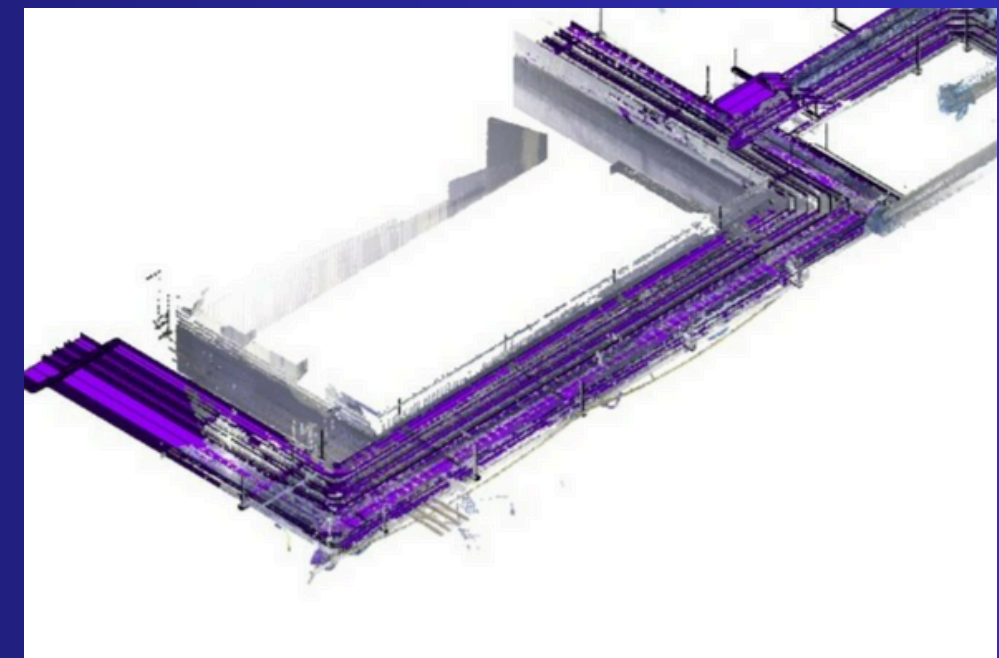
Prefabrication, Modularization and Spooling

- We create accurate spool drawings facilitate spool assembly for piping runs and pre-fabrication.
- We align segmented spool drawings with the contractor's prefabrication standards and preferences.
- Our modular drawings for prefabrication help to lower costs, shorten installation time, and improve site safety.



Scan to BIM and Facility Management

- We provide laser scanning services for renovations and retrofits.
- Our data-rich 3D models, include information like warranties, equipment lists, and product data for facility management.
- With COBie format we enable data collection throughout the design phase, which is subsequently transferred to the owner.



3D Modeling

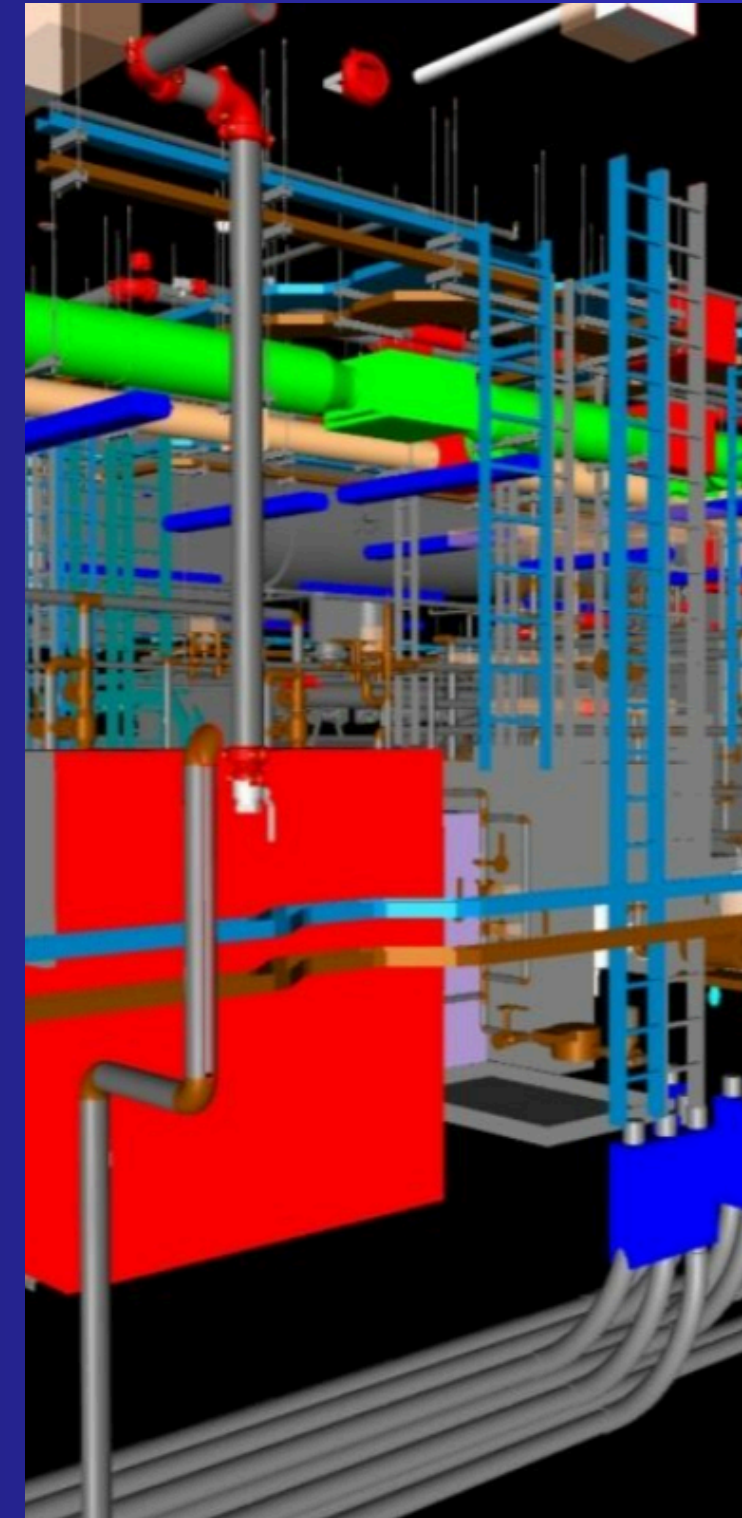
- We work with a wide range of inputs such as pdf, *dwg, *dgn, rvt, *rcp, *rcs, hand sketches, etc., to create:
- 3D models of Lighting Fixtures, MCC, Panels, DBs, transformers, etc., from approved submittals with desired levels of detailing from LOD 200 to LOD 500.
- Modeling of electrical containments and running services
- BIM Model Rendering with Lights
- BIM Model Walk-through in Navisworks

Constructability Review

- Through constructability analysis, we review:
- Adequacy of space for installation, operation, and maintenance of equipment.
- Adherence to codes for bend radius and cable heights as applicable.
- Clearance between HV and ELV services.
- Placement of items with Critical Dimensions.

Clash Coordination

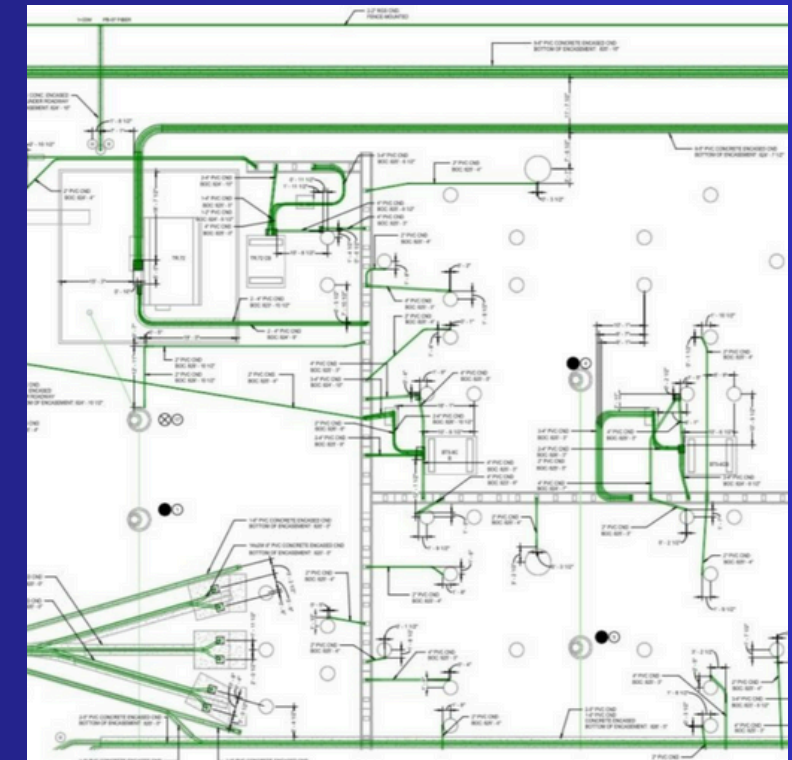
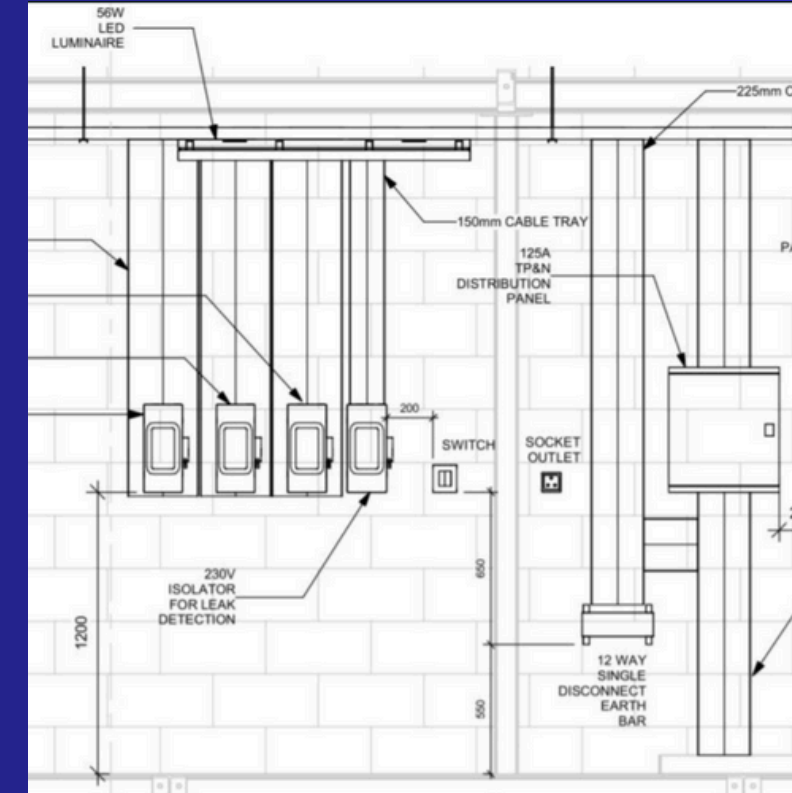
- Through clash coordination, we identify and resolve interference between various building systems.



2D Drawings (Conduit Spools, Sleeves, Power, Lighting)

We create detailed shop drawings to facilitate fabrication and site installation, generated automatically from the 3D model. Any changes to the model are automatically reflected within the shop drawings. Our standard 2D Deliverable include:

- Power Layout and shop drawings
- Lighting Layout and shop drawings
- Sleeve Drawings
- Conduit Spool and Prefabrication drawings
- Insert Drawings
- Security, Communication, and Fire Alarm drawings
- Single-line diagram / Riser Drawings
- Trimble Layout
- Typical inclusions in our Electrical Drawings:
- Tags and legends of equipment for easy identification and traceability
- Ratings and dimensions in accordance with the Manufacturer's Catalogue/Cut sheet
- Network loops and circuit reference
- Positions with reference to the nearest grid lines
- Mounting heights as per the applicable code
- Marking Elevation of services (up/down) as applicable
- Installation & Access clearance in line with the required code
- Feeder schedule



Quantity Take-Off

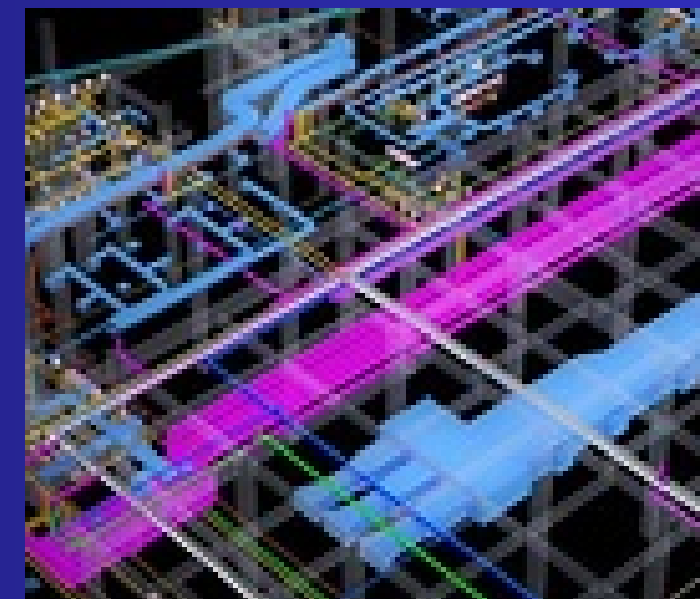
- We extract precise material quantities of all equipment, fixtures, and conduits details in a tabulated format generated from coordinated 3D BIM models to help contractors in estimating project costs and plan material procurement.
- Quantity Take Off is dynamically generated from the BIM Model. This list is automatically updated if changes are made to the existing 3D Model.

Revit Family Creation

- We create parametric families that contain all real-world product information necessary for running calculation analysis and simulations.

Design Development and Validation

- Load Flow Analysis & Phase Balancing
- Short Circuit Analysis
- Schedules & Sizing for Equipment & Services
- Voltage Drop
- Illumination Calculation
- Energy Analysis
- Lighting Control Design
- Fire Alarm Layout
- Single Line Diagram



3D Modeling and Clash Coordination

- We create accurate and information-rich fully coordinated 3D models for inter-trade clash resolution.

Shop Drawing Creation

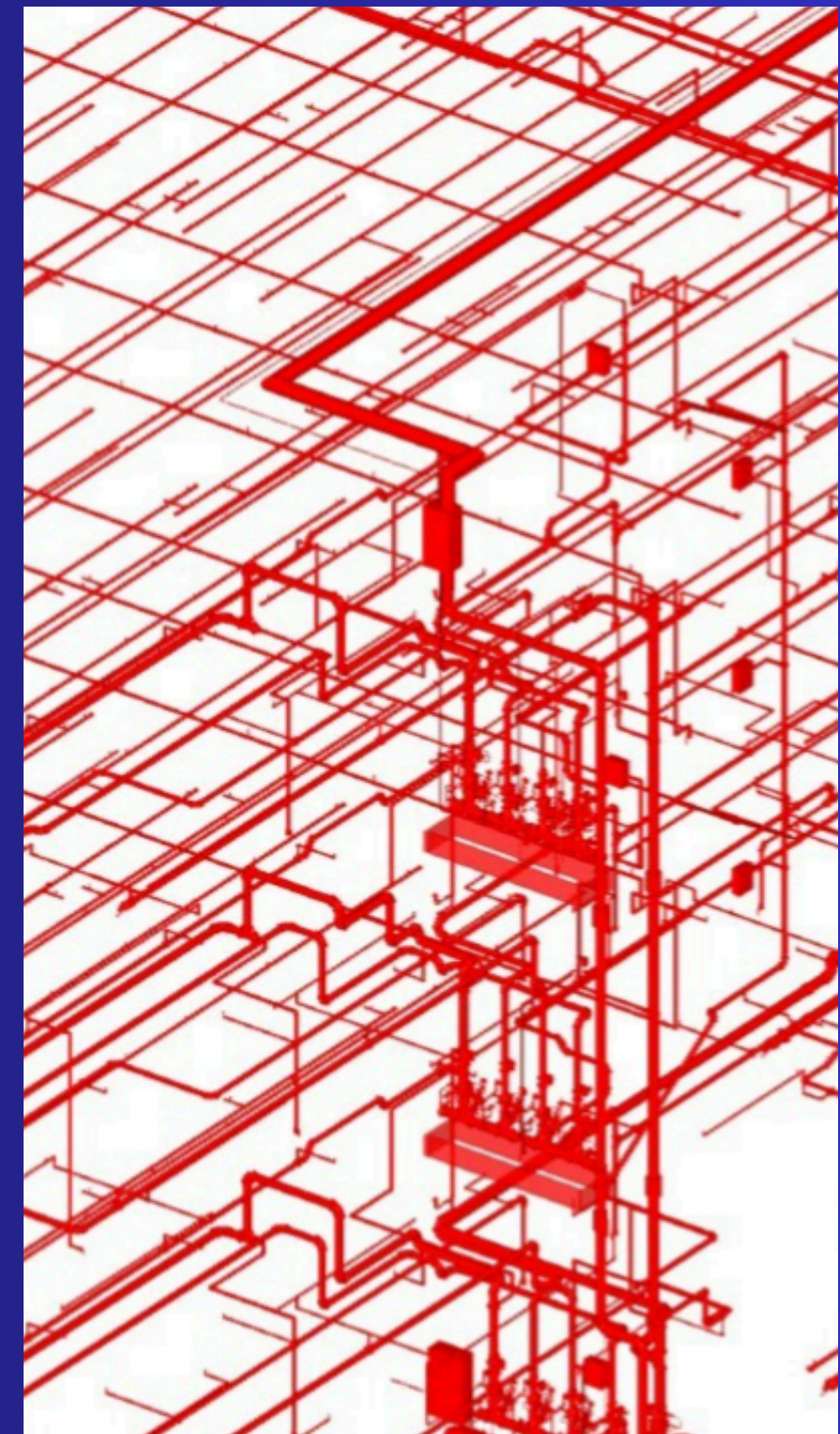
- We create Fire Sprinkler System layouts, including Sprinkler heads, control valves, check valves, pressure gauges, inspector's test valves, hangers, and main and branch lines following Fire Safety norms.
- Our Fire Protection Shop Drawings include Layouts, Floor Plans, Schedules, and Details.

Sleeve Drawing Creation

- We create penetration drawings for slabs and walls with details such as sleeve size, location, and elevation.

Quantity Take-Off

- We extract precise material quantities, generated from the coordinated 3D BIM model that enables clients to estimate project costs accurately.
- The Quantity Take-Off sheet is automatically updated when the BIM model is modified.



Equipment Pad Layout

- **Detailed 3-dimensional Equipment Pad Layouts along with Equipment Tags.**

Constructability Review

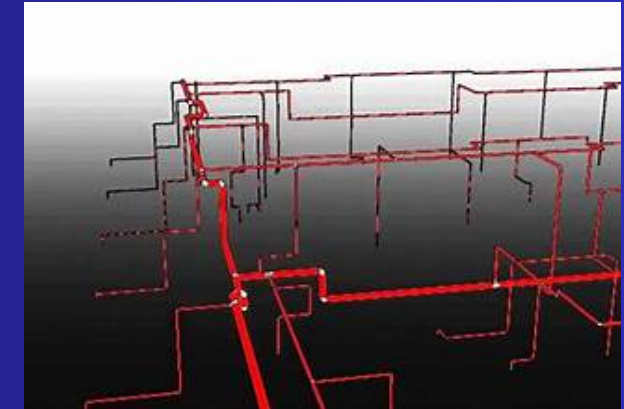
- **A process that determines the accuracy & reliability of construction documents for seamless construction.**

Design Validation

- **Cross-checking layouts, equipment types, and sizes to ensure accuracy and alignment with relevant codes and standards.**

Sprinkler Location

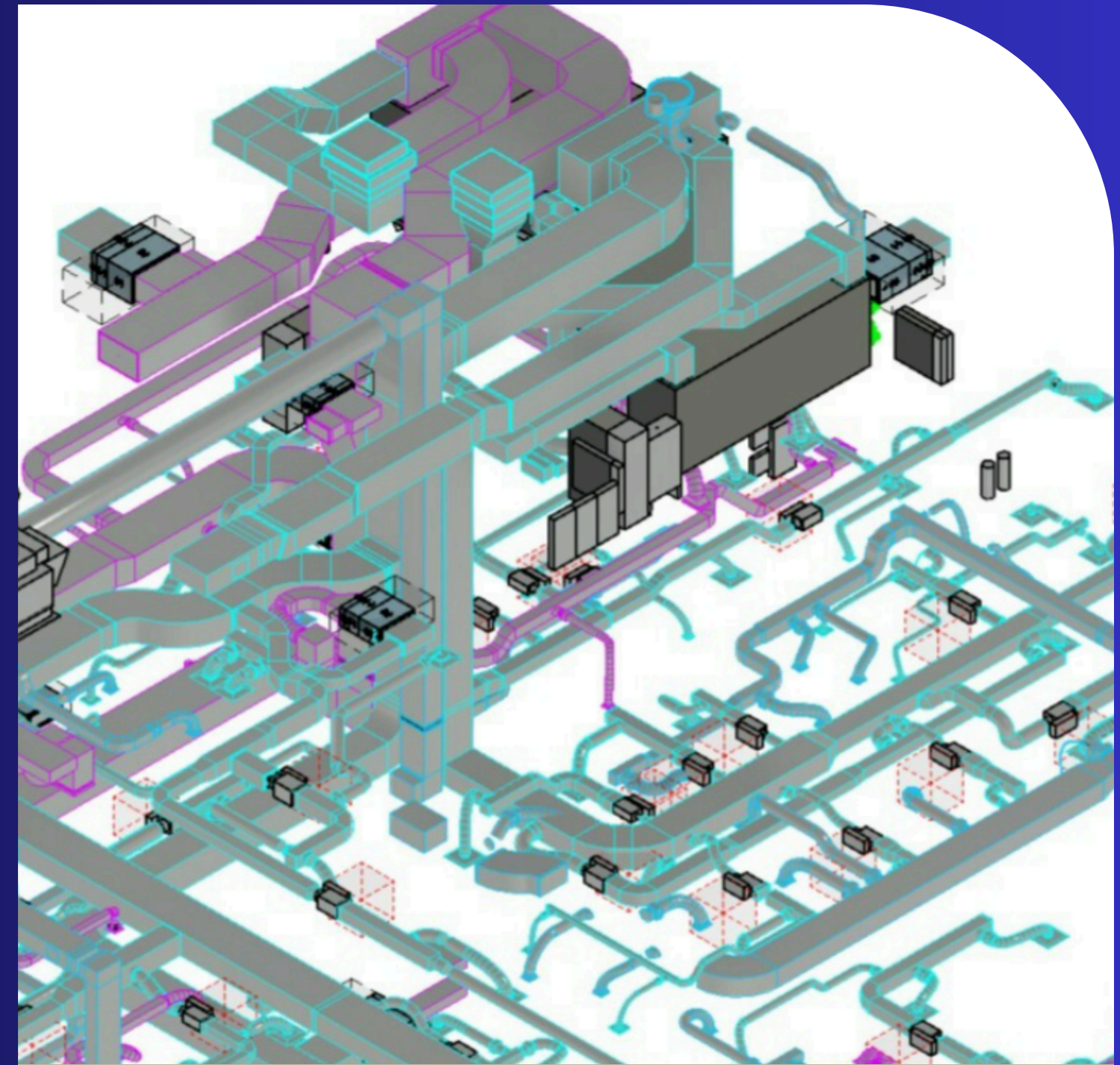
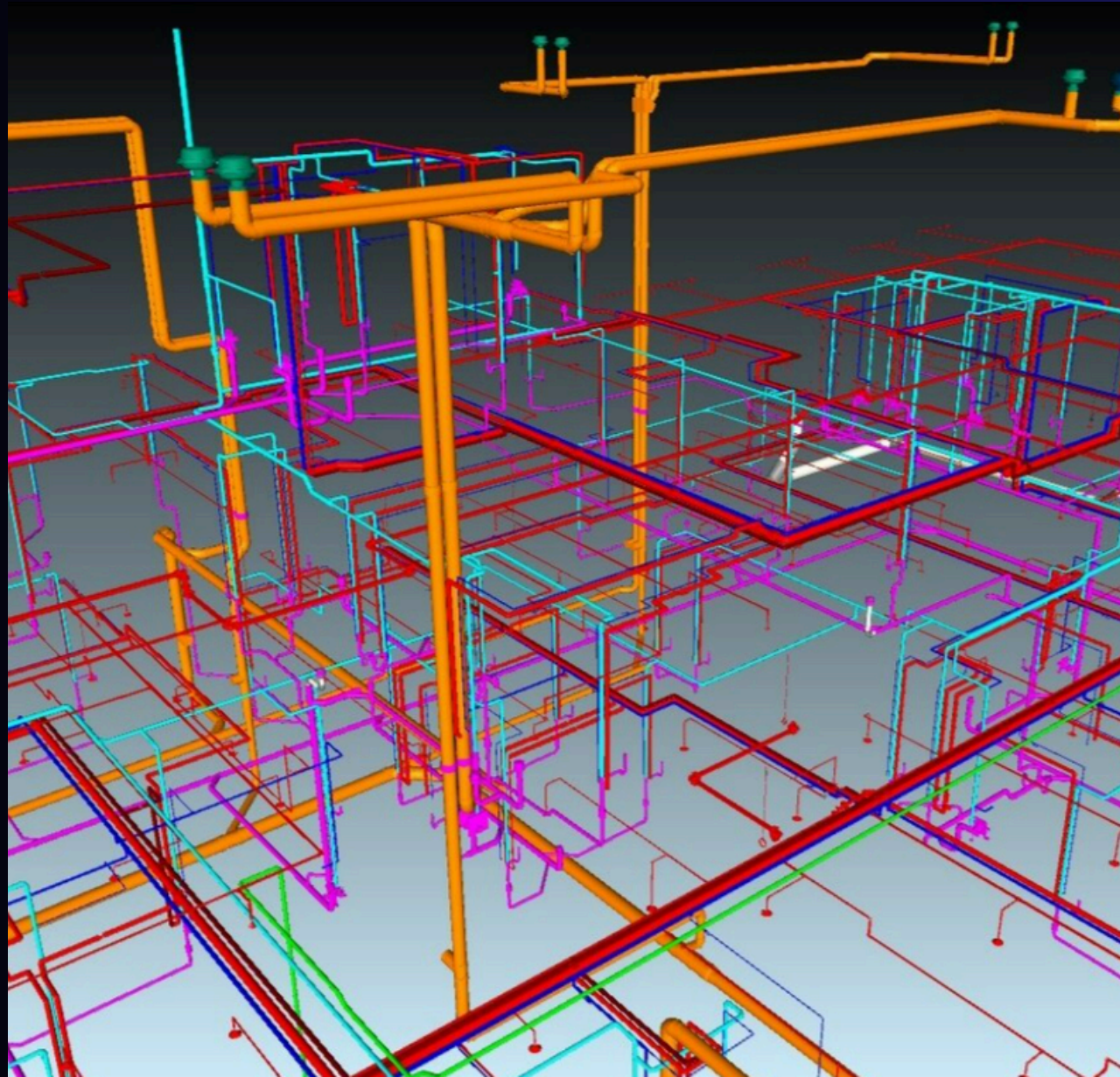
- **Selection of the proper sprinkler system in accordance with the NFPA and local fire standards.**



RENDERING AND VISUALIZATION

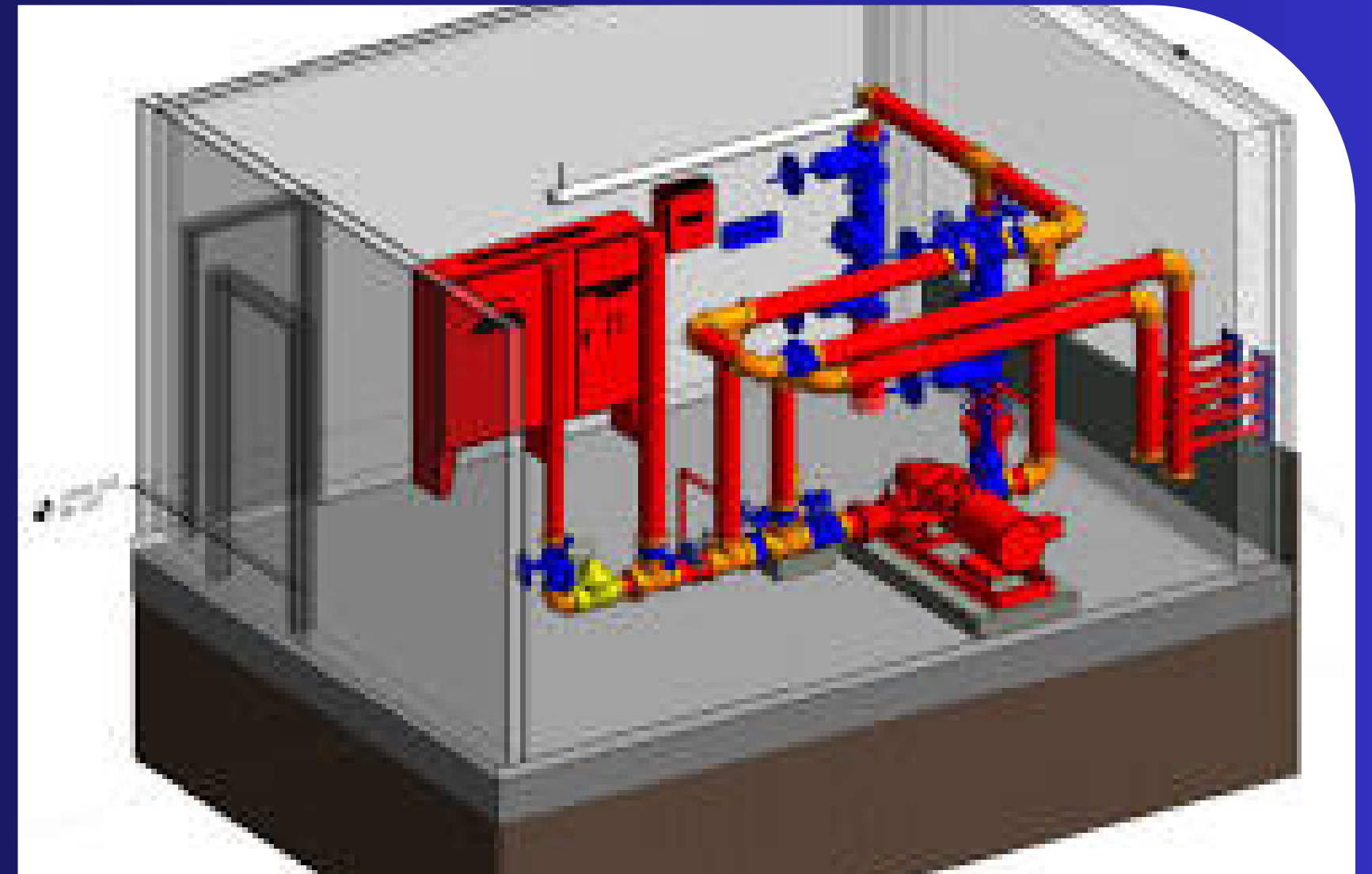
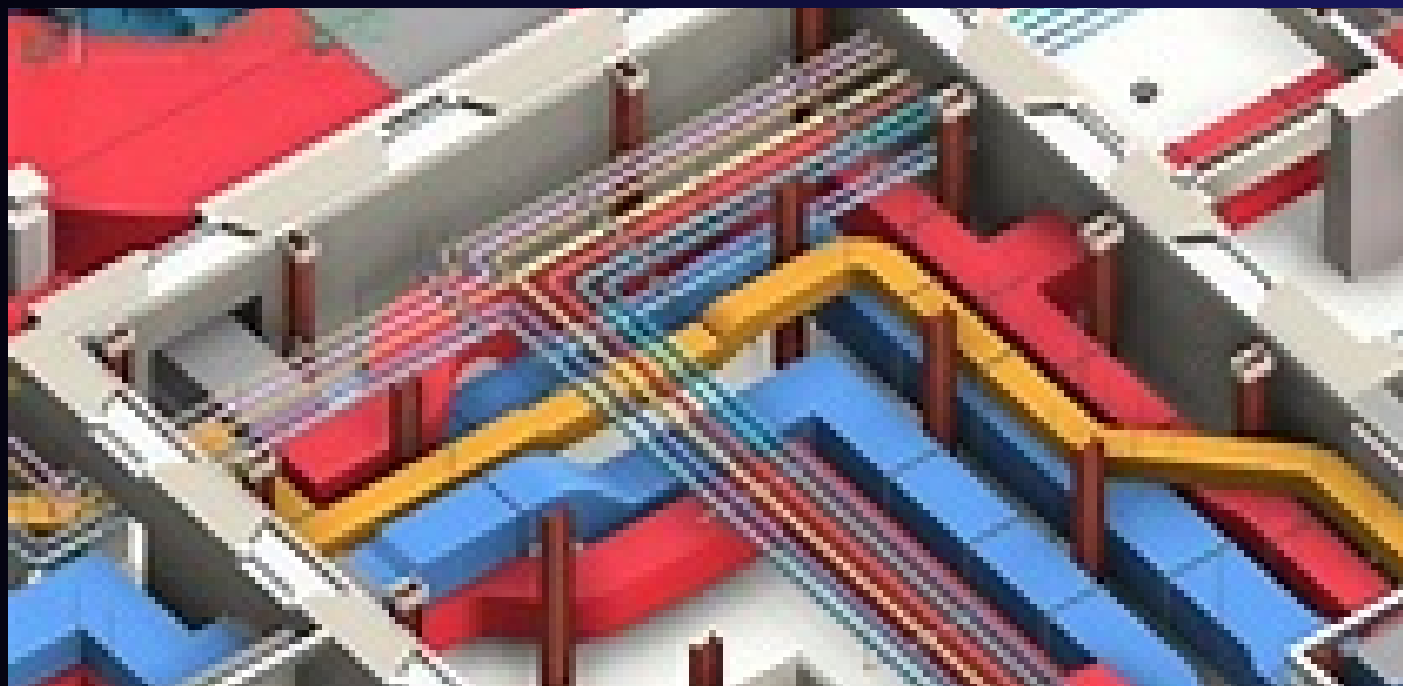
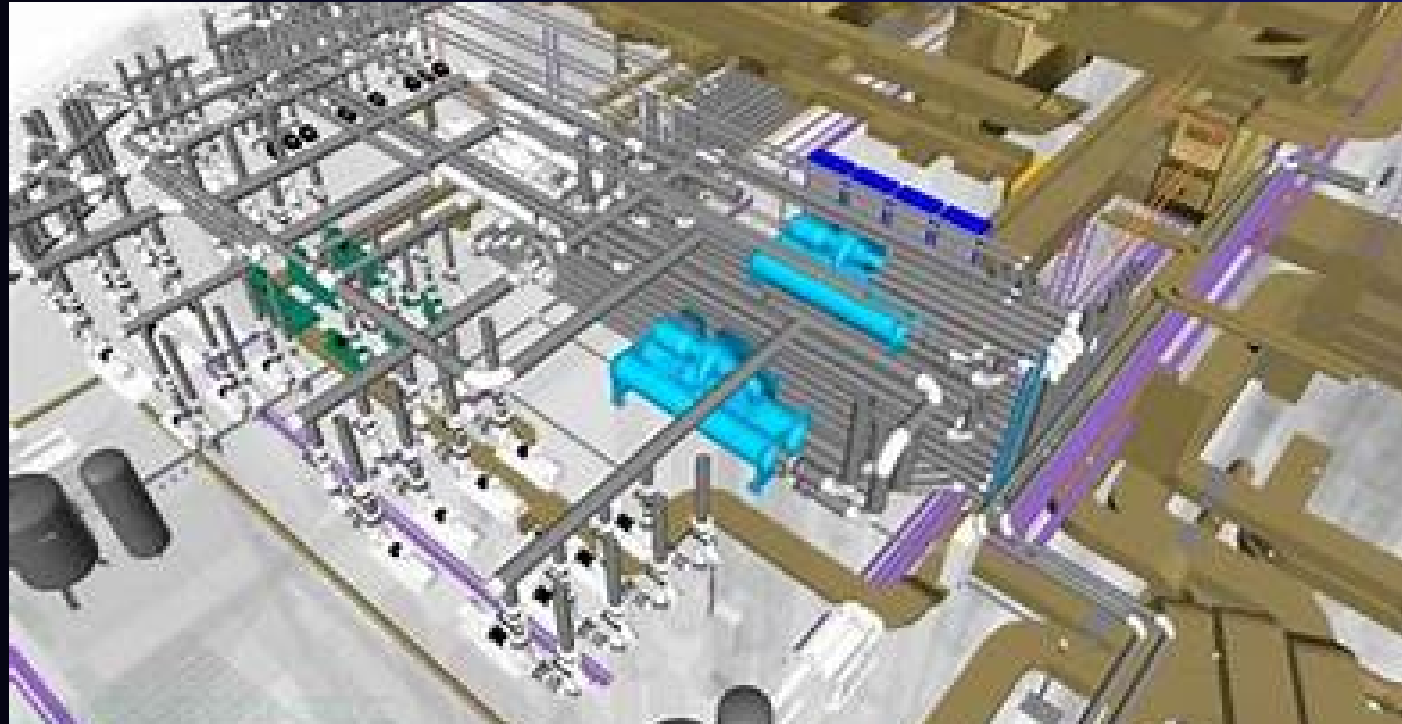


PLUMBING BIM MODEL

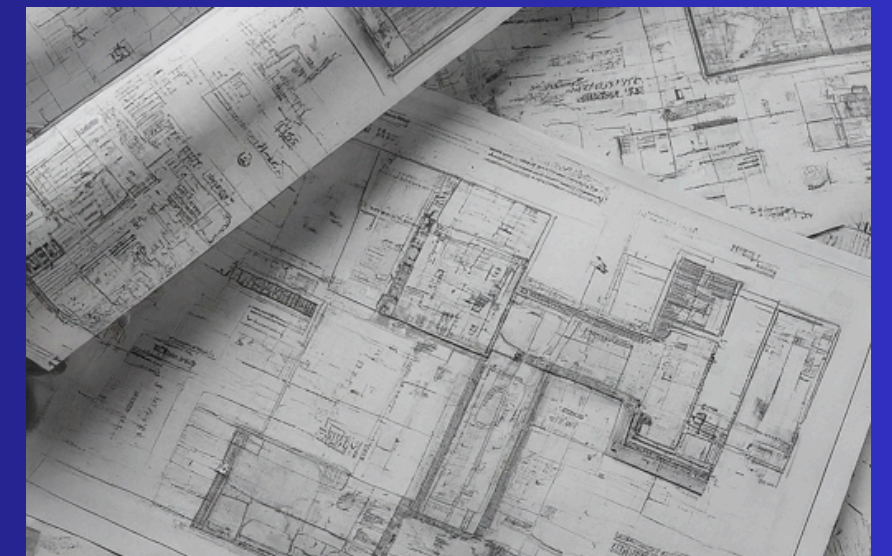


MECHANICAL HVAC BIM MODEL

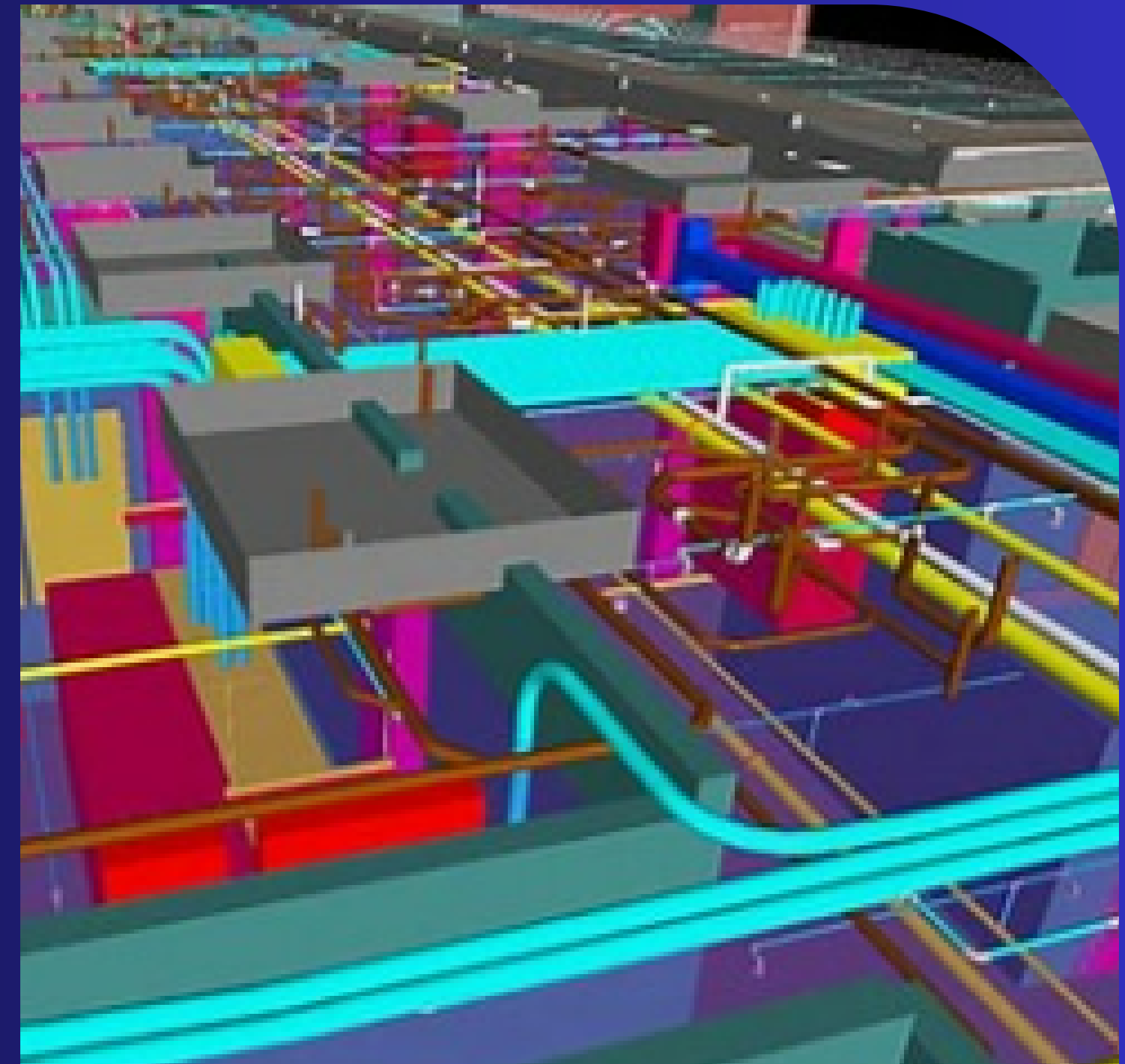
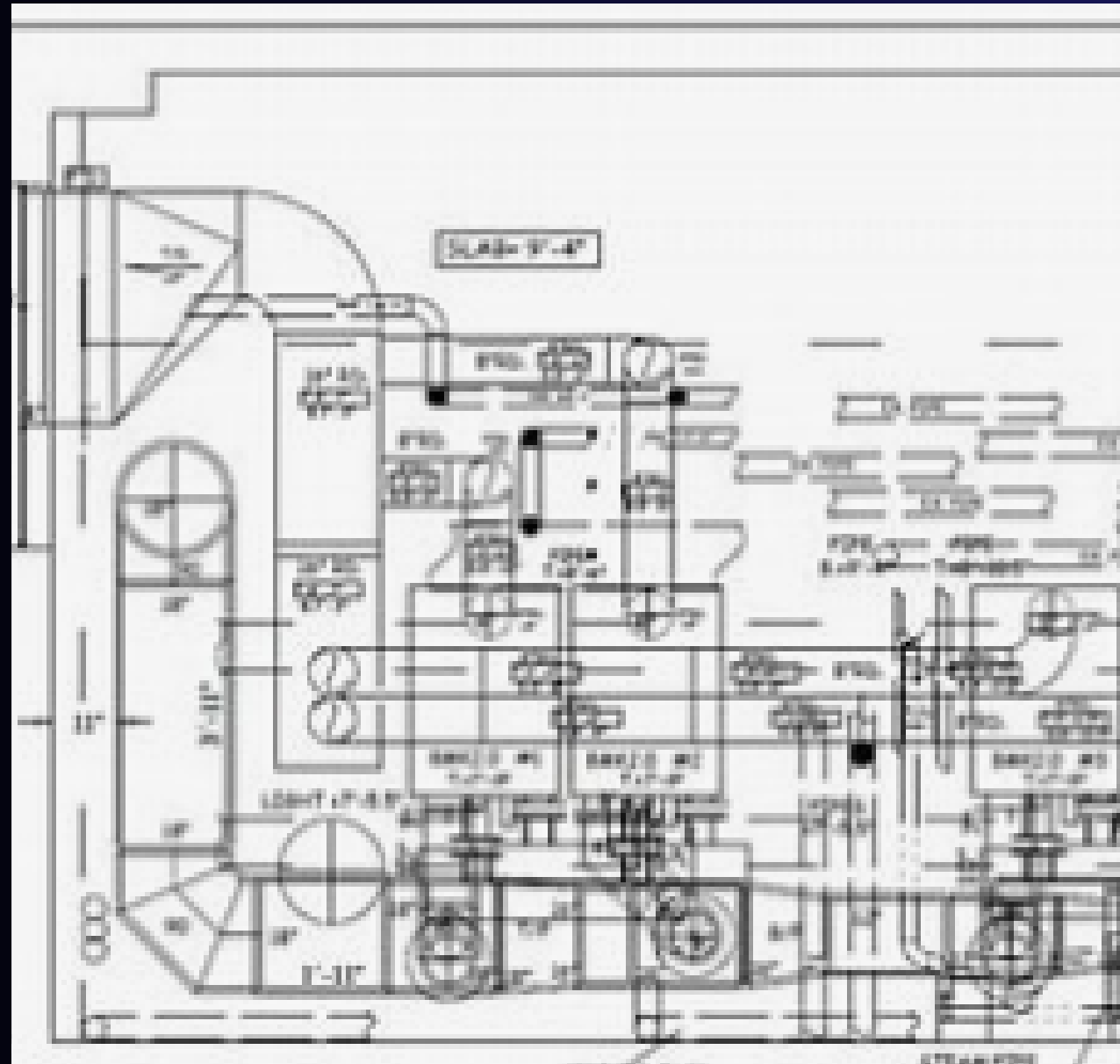
MEP BIM MODELING



MEP SHOP DRAWINGS

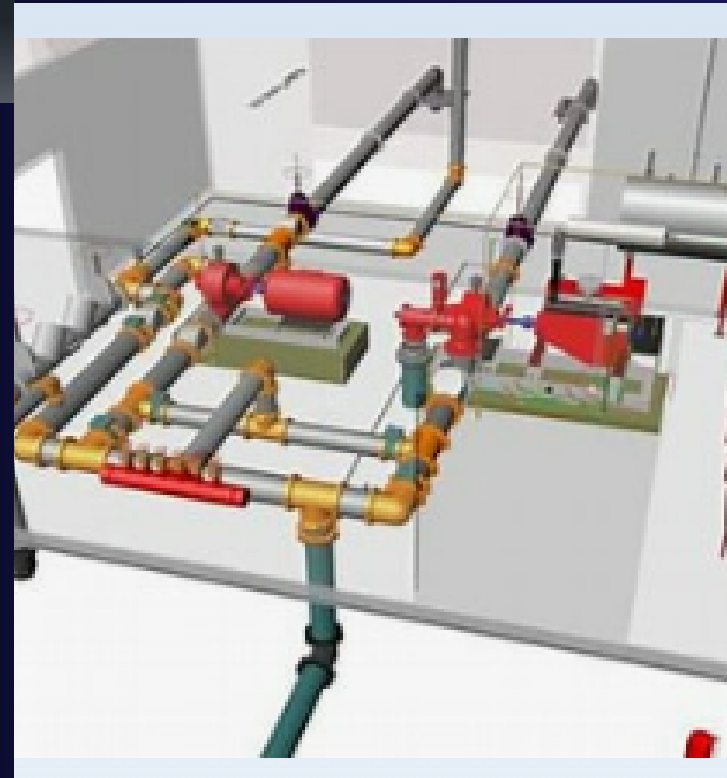


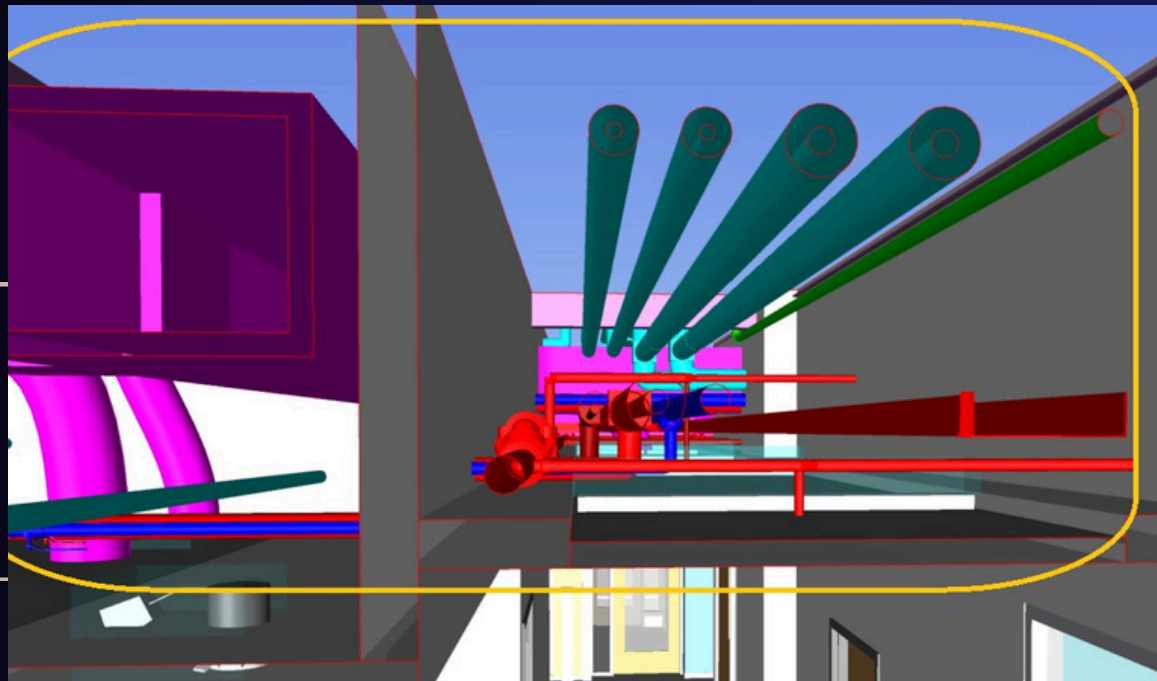
HVAC SHOP DRAWINGS



ELECTRICAL BIM MODEL

FIRE PROTECTION MODELING





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