Since 2012 R3 has been designing and detailing conveyor systems for bulk material handling industries for all global markets. Whether you’re looking for a single conveyor or a complete conveyor system, we can offer you a customized solution tailored to your handling needs. We can provide handling systems for both new projects and existing systems. Whether you are a company with your own detailing office, a fabrication facility or a one-man operation we can provide your design and detailing needs.

R3 Plant Design provide cost-effective shop floor drawings with DXF & NC files to reduce lead-time. We have skilled and specialized mechanical drafting and design team members headed by an Engineering Manager with 15 years of Australian drawing office experience. **Conveyors:**

- Horizontal, Inclined & Curved Belt conveyors
- Belt Feeders
- Fixed & Radial Stackers
- Shutting Conveyors
- Underground mining conveyors, hazardous and non-hazardous zone & long conveyors up to 5km
- Sidewall conveyors
- Pulley & take up mechanism design
- Transfer chutes, Transfer towers & Service Platforms
- Walkways & structures

**Our Service Includes.**

- General Arrangement Drawings
- Generating Tender Models
- Conveyor Calculation report
- Structural analysis & Report
- 3D BIM Modelling & Clash Detection
- Lay out drawings.
- Fabrication Drawings
- Base plate & Anchor plate calculations.
- DXF Files for Plate work
- NC Files for Cutting & Drilling
- Erection Plans
- Material Lists/Take-Offs & Tonnage Estimations
- Anchor Bolt Drawings
- Connection Details
- Bolt List

**Benefits of BIM:**

Our Building Information Modelling (BIM) service provides our clients with an intelligent 3D model, and we carry out a virtual construction analysis to test for construct-ability and potential conflicts. This analysis allow us to accurately predict how various equipment’s and structures will integrate on-site, thus eliminating costly time delays due to onsite clashes and design changes.

**Winning Projects:**

With our Engineering and drafting capabilities, we help our clients to enhance their business by introducing new equipment’s into their product line.

We provide significant cost savings to projects by utilizing local Engineering’s, modelers and detailers, which helps our clients to win competitive projects.

**Save time**

Overall design time reduces when people are working on your project in shifts in turn reducing project lead-time. Moreover, if any urgent design changes are tube made in Australia, would be addressed by following morning benefiting from different time zones.
BELT CONVEYORS - Design & Detailing
OVERALL LAYOUT

Client supplied drawing
RADIAL STACKER
SIDE WALL CONVEYOR
For Australian applications we consistently design to the following Australian Standards, please let us know if your application requires another standards:

- AS1657  Walkways maintenance and access platforms
- AS4024-2015  Safety of Machinery
- AS1755-2000  Conveyor Safety Requirements
- AS4100  Steel Structures
- AS1359  Rotating Electrical Machines,
- AS1470  Health & Safety at Work,
- AWS D 1.1  Structural Steel Welding, American standard
- AS 1554.1  Structural Steel Welding, Australian standard
- AS3990  Mechanical Equipment – Steelwork,
- Occupational Safety and Health Act 1996
- Mines Safety and Inspection Act 1994
- Mines Safety and Inspection Regulations 1995

Our sophisticated conveyor calculation tool provides complete tension and power analysis. Features include:

- Overall profile configurations, during all operating modes.
- Identification of belt and conveyor interface issues.
- Take up tensions, multiple drives, and split-power situations.
- Roller analysis.
- Belt selection tool - recommends carcass, cover grade, and cover gauge.
- Detailed belt data sheets including roll weight and
<table>
<thead>
<tr>
<th>Pulley No.</th>
<th>Flight Description</th>
<th>Location</th>
<th>Label</th>
<th>Same As (Pulley No.)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

### Pulley Details

- **Tension (T1) (kN):** 65.9, 44.5, 44.1, 45.0, 43.8
- **Tension (T2) (kN):** 43.4, 44.7, 44.5, 45.3, 43.6
- **T1 Incom. Angle (degrees):** 345.0, 345.5, 38.6, 88.7, 165.2
- **Wrap Direction:** Clockwise, Counter-Clockwise, Counter-Clockwise, Clockwise
- **T2 Outcom. Angle (degrees):** 194.2, 78.6, 181.9, 103.5, 193.9
- **Pulley Weight (kg):** 873.36, 446.47, 446.47, 446.47, 470.088
- **Resultant Force (kN):** 111.5, 59.2, 84.2, 74.5, 85.7
- **Resultant Force Angle (degrees):** 252.34, 129.78, 357.67, 215.07, 85.22
- **Pulley Diameter (mm):** 782, 606, 606, 606, 606
- **Lagging Gauge (mm):** 12.0, 12.0, 12.0, 12.0, 12.0
- **Lagging Type:** Diamond, Diamond, Diamond, Diamond, Diamond
- **Face Width (mm):** 1200, 1200, 1200, 1200, 1200
- **Pulley RPM (RPM):** 37.5, 48.50, 48.50, 48.50, 48.50
- **Bearing Centers B (mm):** 1700, 1500, 1500, 1500, 1700
- **Dimension A (mm):** 377, 264, 264, 264, 364
- **Shaft Length (mm):** 2476, 1730, 1730, 1730, 1930
- **Shaft Material:** 1045, 1045, 1045, 1045, 1045
- **Shaft Diameter (mm):** 170, 140, 140, 140, 140
- **Bearing Bore (mm):** 130, 110, 110, 110, 110
- **Bearing Type:** Roller, Roller, Roller, Roller, Roller
- **Dynamic Capacity (N):** 738365.0, 453695.0, 453695.0, 453695.0, 453695.0
- **Overhung Load (N):** 0.0
- **Shaft Deflection:** 0.0012, 0.0010, 0.0014, 0.0013, 0.0020
- **Shaft Safety Factor:** 2.03, 5.05, 3.55, 4.02, 2.53
- **Bearing Life (hrs):** 2379737, 3015140, 931749, 1403535, 877304
- **Backstop Required:** Yes
- **Min Backstop Rating:** 14729
- **Backstop Torque:** 5993

**Units:**

Please note that the resulting rating for the idler set is dependent upon the load distribution on each roll. Be sure to input the maximum expected load (conveyor capacity) to ensure calculations reflect the load distribution from the required design conditions.

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### Important RA Inputs

- **Roll Set Tolerance (mm):** 0.0012
- **Roll Diameter (mm):** 127.0
- **Roll Angle (deg):** 0.0
- **Roll Factor - Avg Per Roll (kN/m):** 0.0063
- **Load Factor - Avg Per Roll (N/mm):** 0.0400
- **Roll Width (mm):** 1050
- **Roll Weight (kg):** 22.0
- **Roll Spacing (mm):** 1.80
- **Roll Bearing (in):** 1.22
- **Roll Capacity (ton):** 675
- **Material Density (kg/m³):** 1600.05

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**Design Concerns With Input: Idler Set Will Be Re-Listed Here**
Structural Design

We provide optimized structure designs & reports for conveyors and steel structures.

Our design drawing adheres to Australian, AISC and IS Standards as required by our clients.

Connection Design with details Design calculations & reports

CODE AND STANDARD

- AS/NZS 1170.0-2002 Structural design actions – Part 0, General principles
- AS/NZS 1170.2-2002 Structural design actions – Part 2, Wind actions
- AS 1170.4-2007 Structural design actions – Part 4, Earthquake actions in Australia
- AS 4100-1998 Steel structures
DESIGN METHOD

Structure analyzing using the finite element computer program, subjected to independent loads.

Software also performs a combined bending and axial load unity check in accordance with Australian Standard AS4100-steel structures.

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Seismic Load Calculation - Equivalent Static Method [Per Clause 6.2, AS1170.4-2007]

\[ V = C_0(T_1)W_i \]  

Where,

- \( C_0(T_1) = \) horizontal design action coefficient
- \( C(T_1)S_p/\mu = 0.016 \)
- \( C(T_1) = \) value of the elastic site hazard spectrum
- \( k_0C_0(T_1) = 0.4+2 \)
- \( C_0(T_1) = \) value of the spectral shape factor for the fundamental natural period of the structure (calculated below)
- \( k_0 = \) probability factor
- \( Z = 1.00 \) \[Table 3.1\]
- \( Z = \) hazard factor
- \( W_i = 0.05 \) \[Figure 3.2(c)\]
- \( S_p = \) seismic weight of the structure
- \( \mu = 0.77 \) \[Clause 6.2.2\]
- \( T_1 = \) structural performance factor
- \( \mu = 2.00 \) \[Clause 6.5\]
- \( \mu = \) structural ductility factor
- \( T_1 = 1.25k_0h_0^{0.75} \) \[Clause 6.2.3\]
- \( h_0 = 1.048 \) \[Clause 6.2.3\]
- \( h_0 = \) height from base of the structure to the uppermost seismic weight or mass (in metres)

Wind Pressures Calculation [Per AS/NZS 1170.2-2002]

<table>
<thead>
<tr>
<th>Wind region</th>
<th>Average recurrence interval</th>
<th>Terrain category</th>
<th>Density of air</th>
<th>Regional wind speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4</td>
<td>250 Years</td>
<td>Category 2</td>
<td>1.20 kg/m³</td>
<td>44 m/s</td>
</tr>
</tbody>
</table>

Wind direction multipliers (M\(_{\text{dir}}\)):

<table>
<thead>
<tr>
<th>Cardinal directions</th>
<th>N</th>
<th>NE</th>
<th>E</th>
<th>SE</th>
<th>S</th>
<th>SW</th>
<th>W</th>
<th>NW</th>
<th>Any Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.90</td>
<td>0.85</td>
<td>0.90</td>
<td>0.90</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.90</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Shading multiplier \( M_s \): 1.0 \[Considered conservatively\]

Topographic multiplier \( M_t \): 1.0

Where,

- \( M_s = \) hill-shape multiplier
- \( M_t = \) for an assumed \( H/2l_a \), value < 0.05
- \( M_{\text{lee}} = \) lee multiplier
- \( M_{\text{lee}} = 1.0 \)

Site wind speeds (\( V_{\text{lee}} \)):

\( V_{\text{lee}} = V_{\text{n}} M_s M_{\text{lee}} M_t \) \[Considered conservatively\]

Dynamic response factor \( C_{\text{dyn}} \): 1.0

Aerodynamic shape factor \( C_{\text{sh}} \): -0.6

Design wind speed \( V_{\text{design}} \): 48 m/s

Pressure at the specified elevation [in N/m²]:

\[ p = (0.5 \rho_{\text{air}}) (V_{\text{design}})^2 C_{\text{sh}} C_{\text{dyn}} \]

\[ p = -0.813 \text{ kN/m}^2 \]
R3 Plant design founded by Anthony Foster, in 2010 collaborating with an Indian design company. The goal was to build a cost effective design and detailing company specializing in belt conveyors and structures. It is a unique combination of Australian design with Indian modelling and detailing team to meet the challenges of the Global Market. Nowadays the company is involved in various projects and expanding business activities to Europe, Australia, and South Africa.

Founder member, Anthony Foster has over 20 years’ experience in designing belt conveyors & structures. He started his career at Worley Parsons in Australia as a Design Engineer and has worked at various senior levels in India and South Africa.

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