



PVC Extrusion

Shipping & Handling

WBS 2.4.5

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WBS 2.4.5 - S & H Overview

- 16 cell production extrusions are stacked to fit on a 53' enclosed truck trailer for transport
 - Maximum planned stack is 30 high by 2 wide
 - Supported by a pallet system
 - Moved around the factory floor and on and off trucks by an air caster system
 - Will be used by other transport phases of the experiment as well
- Cost & schedule details are split
 - WBS 2.4.5
 - 2.4.5.2 Pallet Systems
 - 2.4.5.3 Pallet Motion Systems
 - 2.4.5.4 Pallet Systems Recirculation
 - WBS 2.4.2 & 2.4.3 Extrusion pre-production and production schedules





WBS 2.4.5.2 – Pallet System

- **Begins with commercially available plastic pallets**
 - Come with a dynamic load rating of 5,000lbs each (40,000lbs total)
 - Full load of 62 Vertical extrusions is ~ 28,450 lbs
 - Allowable load on truck is 45,000 lbs
 - Are nestable for economy of floor space and recirculation costs
 - 1620 pallets fit on a truck
 - Use eight 48" x 40" pallets per full length extrusion stack
- **Cost & Schedule**
 - Pallets (One Way Solutions PP-S-40-NM quote provided 03/06/07)
 - 1120 pieces (# based on production schedule – not totals)
 - Add 800 pieces for stored stacks at Factories 1 & 2
 - Add 200 pieces for spares (~10%) = **2120 total**
 - Delivery scheduled for ½ at the beginning of the pre-production extrusion run – Sept '09
 - ½ just prior to beginning of extrusion production for Superblock 1 – Nov '09
 - Pallets will be re-circulated after that

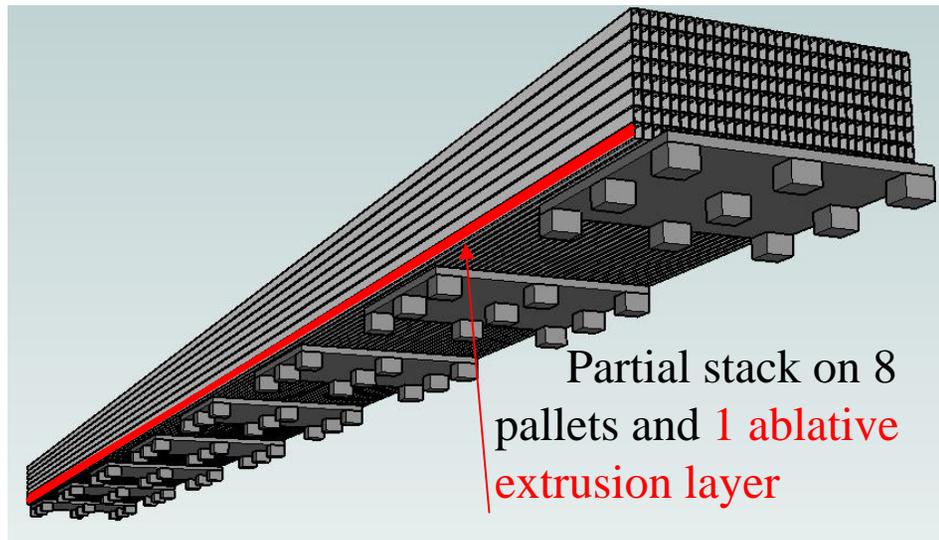


PP-S-40-NM



WBS 2.4.5.2 – Pallet System

- Pallets are bridged with pieces of the extrusion itself
 - Exact fit for best support on the live extrusion edges
 - No additional floor space required at the extrusion facility
 - Single layer of ablative extrusion distributes the lift load
 - (see NOvA DocDB 978 for stress calculations)





WBS 2.4.5.2 – Pallet System

- **Cost & Schedule of extrusion bridges**
 - Delivery is JIT for the first 280 pieces; 200 storage pieces Nov '09
 - Manufacture 2 for each stack for the first 2 superblocks + the 200 for stack storage
 - Will save structurally sound QA failure extrusions for production bridges as well as extras if required
 - Cost for bridges is captured in various level 6 elements of WBS 2.4.2 & 2.4.3
 - (Costs of additional PVC resin for storage bridges is found in 2.4.5.2.3)
 - WBS 2.4.5.2.2 contains all equipment for banding pallet systems
 - Tooling includes banders, tensioners & sealers
 - Consumables include Tenax strap material, clips & corner protectors
 - All tooling ordered and delivered prior to start of pre-production – Sept '09
 - Costs taken from Grainger Industrial Supply Online Catalog 05/16/07
 - End Wrap
 - 40 linear ft/stack x (532+8)stacks = 52 rolls of 48" x 500' low tack poly
 - Costs taken from CarpetBarrier.com Online Catalog 05/16 2007



WBS 2.4.5.3 – Pallet Motion Systems

- Loaded stacks of extrusions (and later, modules) will be moved around factories and on/off trucks using air casters
 - Purchased as a package from vendor (with training included)
 - Air pads, hoses, controllers, overlay for truck floors & truck jacks
 - Segmented overlay requires air pillow jacks to raise pallets to slide overlay under load
 - Have added a motorized pallet jack to help steer
 - Planning on addition of dedicated compressor for production
 - Air casters require ~ 150 scfm per system @ 25 psi

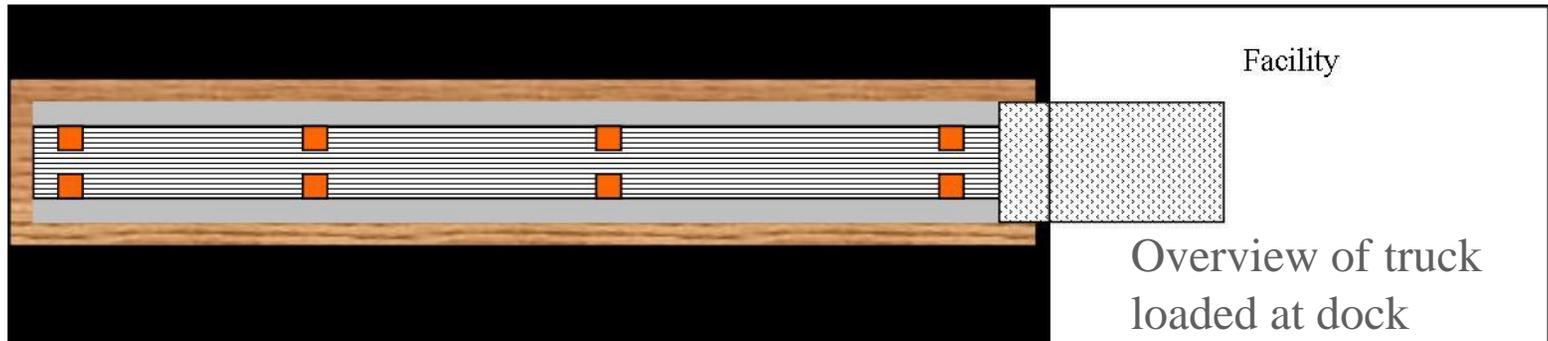
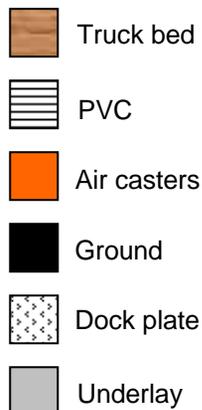




WBS 2.4.5.3 – Pallet Motion Systems

- **Cost and Schedule**

- Delivery dates to locations are tied to the beginning of pre-production + required in time for set-up
 - Pre-production at extruder begins Sept '09
 - Pre-production @ Factories 1 & 2 begin Sept '09
 - Required at Ash River concurrently for staged set-up in facility
- ASE Systems air caster system (ASE Systems quote provided 02/08/07)
- Pillow Jacks for overlay placement (ASE quote provided 02/08/07)
- Rand electric pallet truck (Rand MH web catalog costed on 05/16/07)
- Ingersoll-Rand air compressor (quote pending)



Concept drawing of air casters in use – not to scale / no pallets shown



WBS 2.4.5.4 – Pallet Recirculation

- Main items of the pallet system can be re-used
 - Commercial pallets
 - Ablative extrusion bridges
 - Extra extrusion PVC budgeted for size tolerance QA failure can be used to provide make-up at Factory 2 (MN) if necessary
 - Return trips from the Far Detector site to the extrusion house will bring extrusions and pallets back for re-use
 - Recirculation quanta is 2 superblocs of Far Detector
- Cost and Schedule
 - Cost for recirculation is trucking only
 - Ash River to Manitowoc pricing for line haul (base) & fuel surcharge provided by C H Robinson Worldwide on 12/05/06
 - Schedule
 - Ablative extrusions return when a truck-load is ready (62 pieces) and/or upon receipt at the Detector site of a superbloc worth of modules – production indicates 12 truckloads total
 - Pallets return upon receipt at the Detector site of a superbloc worth of modules – 6 truckloads total



WBS 2.4.2.x & 2.4.3.x – Shipping of Extrusions

- A shipping task is included in all phases of the production schedule & directly tied to that schedule
 - Does NOT appear in WBS 2.4.5
 - 2.4.2.1.13.2 & 2.4.2.2.13.2 are preproduction shipping tasks
 - Each 2.4.3.2.x includes a level 6 shipping task
 - Truck transport
 - Consumables used to package extrusion stacks
 - Wrap for the open ends of extrusions
 - Tenax banding material, clips & edge protectors
- Costs
 - 538 trucks from extrusion facility to Factory 1
 - Manitowoc to Batavia pricing for line haul (base) & fuel surcharge provided by C H Robinson Worldwide on 12/05/06
 - 2 trucks from extrusion facility directly to Factory 2
 - Manitowoc to Minneapolis/St Paul pricing for line haul (base) & fuel surcharge provided by C H Robinson Worldwide on 12/05/06



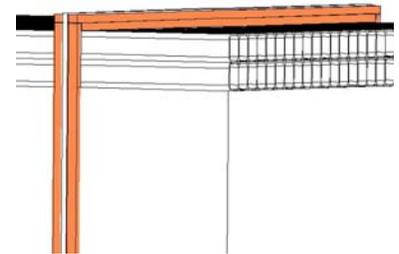
WBS 2.4.5 & 2.4.2 & 2.4.3 - S & H Risks

- **Scheduling Risks**

- Trucks not available to transport
 - Arrange for possible short term holding of stacks at extrusion facility
- Factory 1 unable to accept extrusions
 - Arrange for possible short term holding of stacks at extrusion facility
- Trucks unable to return to extruder with pallets & bridges
 - Maintain stock of pallets @ extruder; extrude bridges as required

- **Materials Handling Risks**

- Stacks of extrusions not stable during transport with banding alone
 - Add stiff stringer supports
 - Stabilize during transport with cribbing in truck trailer
 - Will learn from upcoming prototype run
- Air caster system failure
 - Two systems in each location
- Compressor failure
 - Arrange prompt service maintenance contract or rent compressor



- **Risks are managed by logistics & pre-planning and are therefore extremely LOW**