

10 - PART SPECIFICATION DOCUMENT



1. Product Name

NUDURA® Integrated Building Technology
Insulated Concrete Form System

2. Manufacturer

NUDURA® Corporation
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CANADA

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3. Product Description

BASIC USE

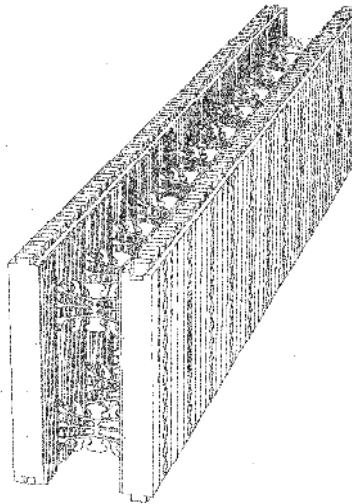
NUDURA® Integrated Building Technology Insulated Concrete Forms (ICFs) are used as stay-in-place permanent formwork for structural concrete, load-bearing and non-load bearing, below-grade and above-grade walls. The forms are used in construction of plain and reinforced concrete beams, lintels, exterior and interior walls, and foundation and retaining walls. The forms remain in place after placement and curing of concrete which is required by all Codes to be protected by approved interior and exterior finish material. Subject to the specific provisions for codes for each country the forms may also be used for applications requiring:

- Fire resistive construction
- Non-combustible construction for buildings of any height and any building area.

COMPOSITION & MATERIALS

NUDURA® Insulated Concrete Forms consist of two uniform thickness panels of expanded polystyrene (EPS) foam plastic insulation material that are cross-linked in parallel with a combination of injection molded polystyrene fastening strips fitted with polypropylene plastic insert webs and integrally molded foldable polypropylene hinged web/fastening strips. The EPS panels are connected together with either integrally molded foldable high-density polypropylene hinged web/fastening strips or injection molded high-density polystyrene fastening strips interlinked with high-density. The web/fastening strips run full height of the form panels and are embedded within the EPS at regular 8 inch (203mm) intervals and are recessed 1/2 inch (12.7mm) from the EPS surface and feature a surface

fastening flange that measures 1 1/2" (38mm) in width. The webs connecting to the fastening strips also have openings to permit concrete to pass through and feature a variety of seat options for support and lockage of horizontal steel reinforcing bars. Either configuration of web/fastening strip serves to separate the EPS panels at a prescribed core distance and provide anchorage surface for attachment of interior and exterior finishes.



Both the EPS panels and web/fastening strips are molded with a preformed reversible interlock and vertical clip-locking mechanism on their top and bottom edges to facilitate stacking and vertical inter-locking of the form units.



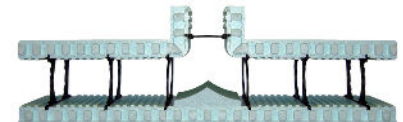
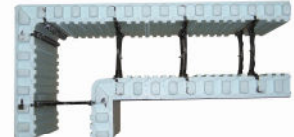
FORM TYPES, OPTIONS & SIZES

NUDURA® standard form panels and hinged web forms are available in a standard length of 96 inches (2438 mm) and a standard height of 18 inches (457mm). NUDURA® Forms are available in widths of 9 1/4, 11 1/4, 13 1/4, 15 1/4 and 17 1/4 inches (235, 286, 337, 388 and 438 mm) to enable formation of 4-inch, 6-inch, 8-inch, 10-inch and 12-inch (102 mm, 152 mm, 203 mm, 254 mm and 305 mm) thick flat monolithic concrete walls respectively.

45-degree and 90-degree angle form units, "T"-form units, brick ledge forms, brick ledge extensions, height-adjusters (with fastening ties) and end caps are also available for each thickness of form unit offered. The corner and "T"-form units are used to

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construct wall intersections. The brick ledge forms and brick ledge extensions are used to construct concrete corbels for support or brick or stone veneer exterior finishes or for supporting limited load interior floor construction.



CONCRETE:

Concrete is typically specified as normal-weight concrete, complying with the applicable code, having a maximum aggregate size of 1/2-inch (13mm) for up to 6-inch (150 mm) core forms and 3/4 inch (19 mm) for 8-inch (203 mm) core forms and beyond and a minimum compressive strength of 2,500 psi (17.25 MPa) at 28 days.

REINFORCEMENT:

Walls are normally reinforced with deformed steel bars, having a minimum yield stress of either 40 Ksi (275 MPa) or 60 Ksi (413 MPa) depending upon the structural design.

OTHER COMPONENTS:

Wood members in contact with concrete or plates or window and door framing shall be treated with an approved wood preservative in accordance with the applicable code. Materials other than wood, such as vinyl, are permitted for window and door framing if approved by the building official.

LIMITATIONS

Refer to NUDURA's® Design Specification Manual for suggested use limitations for each core thickness of form and for general guidance on the most appropriate cavity thickness of form for each wall design scenario. Brick ledges are limited to a factored structural load capacity of 1,440 lbs (6.405 KN)

4. Technical Data

APPLICABLE STANDARDS - USA

- ACI 318 - Building Code Requirements for Structural Concrete
- ASTM C578 -Standard Spec. for Rigid, Cellular Polystyrene Thermal Insulation
- ASTM D1761 -Mech. Fasteners in Wood
- ASTM E84 -Surface Burning Characteristics of Building Materials
- ASTM E-119 -Fire Testing of Building Construction and Materials
- NFPA 259 -Standard Test Method for Potential Heat of Building Materials
- NFPA 268 -Ignitibility of Exterior Wall Assemblies via Radiant Heat Energy Source
- NFPA 285 -Flammability Characteristics of Exterior Wall Assemblies Containing Components Using the Intermediate Scale Multi-Story Test Apparatus
- NFPA 286 -Evaluating Room Fire Growth Contribution of Wall and Ceiling Int. Finish,

APPLICABLE STANDARDS - CANADA

- CAN4-S114 – Determination of Non-Combustibility in Building Materials
- CAN 4-S124 –Evaluation of Protective Coverings for Foamed Plastic
- CAN/CSA A23.1 Concrete Materials and Methods of Concrete
- CAN/ULC-S101 – Fire Endurance Testing of Building Construction and Materials
- CAN/ULC-S102 – Surface Burning Characteristics of Building Materials and Assemblies
- CAN/ULC-S134 - Fire Test of Exterior Wall Assemblies
- CAN/ULC-S701 –Thermal Insulation, Polystyrene, Boards and Pipe Covering

APPROVALS

System is currently approved for compliance with the following Building Codes

USA Under ICC-ES ESR-2092

- 2003 *International Building Code*®
- 2003 *International Residential Code*®
- 1999 *BOCA® National Building Code*
- 1999 *Standard Building Code*©
- 1997 *Uniform Building Code*™

CANADA Under CCMC 13063-R

- 2005 *National Building Code*
- 1990 *Alberta Building Code*
- 1995 *British Columbia Building Code*
- 1997 *Ontario Building Code*
- 2001 *Quebec Building Code*

EUROPEAN UNION Under EOTA/BBA 2762

- All applicable Codes for all 26 Countries of the European Union

Various individual State, Provincial and City compliances can also be provided by the manufacturer. Contact the NUDURA® for copies of these compliances as may be required for your region.

CERTIFICATIONS / LISTINGS



Plant Manufacturing is under 3rd party quarterly audit and product certification is provided by ITS N.A. Ltd. /ETL Semko



Product is also listed/classified by UL and UL Canada for fire resistance to 2, and 4 hours per the followings listings/classifications:

- USA: U930 (2, and 4 hour)
- CAN: W012 (2, and 4 hour)

Refer to above noted listings for applicable core thicknesses, concrete specs and finish requirements for attainment of listings or contact the manufacturer or distributor.

ENVIRONMENTAL CONSIDERATIONS

LEED® CREDIT DATA

Energy efficiency, air tightness, low waste factor, efficient construction methods and recycle content are features which suit application of NUDURA® ICF product to any GREEN Building Project or LEED Accredited facility.

LEED® Credits which NUDURA ICFs target for POTENTIAL point achievement include:

LEED® Credit Categories	Potential
Sustainable Sites:	0
Water Efficiency:	0
Energy & Atmosphere:	1 - 19
Materials & Resources:	1 - 6
Indoor Environmental Quality	1
Innovation & Design Process	0
Possible Total Points	1 - 26

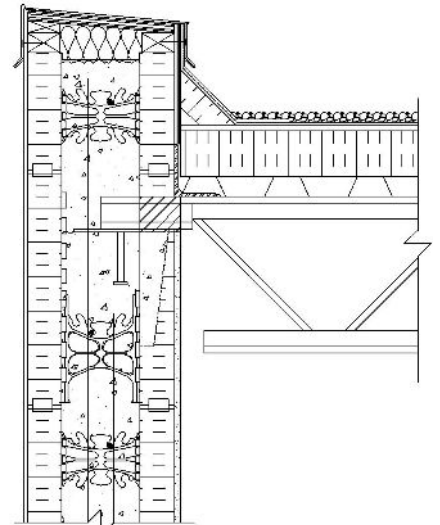
Contact the manufacturer for specifics on the potential contribution in each category for point attainment.

PHYSICAL/CHEMICAL PROPERTIES

EPS FOAM	
Thermal Resistance	Min. R4 / inch Min. RSI 0.70
Flame Spread Rating	USA <10 CAN 180
Smoke Developed Index	USA <450 CAN <450
Self Ignition Temperature:	Min. 650 Deg F Min. 343 Deg C
Water Vapor Perm'ce:	0.624 Perms/ 36 ng/Pa.s.m ²
Water Absorption	Max. 3%
Compressive Strength	Min.15 psi/103.4kPa
Flexural Strength:	Min. 35.0 psi /241.3kPa
Limiting Oxygen Index	Min. 24%
Thermal & Humid Aging	Max.2.0% Variance
Fungi Resistance:	No Growth

POLYPROPYLENE WEBS

Self Ignition Temp.	Min. 650 Deg F Min. 343 Deg C
Smoke Density Rating	Max 75%
Rating of Burning	Max. 1 ½"



5. Installation

Complete detailed installation recommendations are available from the manufacturer. NUDURA® regularly provides training sessions to contractors, building officials, architects and engineers through the distributors located in each country of operation. Details regarding locations of these courses are available at the Manufacturer's website.

PREPARATORY WORK

Handle product from transport to site storage as per manufacturer recommendations. Store product in original packaging and retain on labels for QC follow-up if required. Prepare site as per manufacturer's Installation instruction manual. -footings within +/- ¼" (6 mm).



METHODS

For detailed outline of installation processes refer to manufacturer's installation instructions. Product is generally bond stacked on site to projected wall layout pattern course by course with horizontal steel being inserted at each course or as specified. Standard forms are cut to suit wall length as required to butt to preformed corner forms or 'T'- form Units. During process, manufacturer's approved alignment system is erected at 3rd course to facilitate wall access and alignment of wall assembly during concrete placement.



Window and Door openings are also prepared during build using permanent or temporary buck materials which will support concrete during placement. Once at projected wall height, vertical reinforcing steel is inserted into wall cavity as specified. Concrete placement is recommended using boom pump and internal vibration to assure even placement and monolithic pour condition.

PRECAUTIONS

Alignment system and or/scaffolding false work to remain in place until lateral connection to wall is complete or as designated by engineer of record for site. Work crews must comply with all local jobsite safety codes and standards/regulations.



6. Availability & Cost

AVAILABILITY

Product is available through North American wide distribution as well as distributorships throughout the UK, Ireland, Scotland, Wales and UAE. Product delivery is typically within 2 weeks within North America. Contact manufacturer directly on delivery times for orders in excess of 50,000 ft² (4,500m²)

COST

Contact manufacturer for direction to local distributor location for provision of form costs /area or total project quotations for best discounted rates. All costs of form work are supplied at distributor level only – no direct pricing is available from manufacturer.

7. Warranty

NUDURA® Corporation provides limited warranty that product will provide and maintain both its minimum thermal resistance (R23.59 / RSI 4.158) (Conductance = 0.2405 W/m².K) and Acoustical performances properties (STC 42 for its 4-inch (102 mm) Core form) and STC 50 for its 6-inch (152mm) and above core thickness forms for a period of 30 years from date of delivery to client. Complete details of manufacturer's limited warranties can be obtained from the manufacturer or through its distributor network.

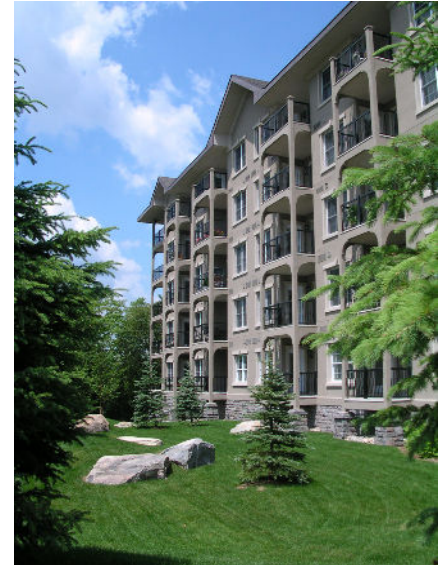
8. Maintenance

ON-SITE STORAGE

Keep product in original packaging until ready for use. Store under tarpaulin cover or inside if storage is required over several months to protect material from prolonged UV exposure.

DURING CONSTRUCTION

Clean concrete splatter from surfaces while concrete is still wet. For most trowel-able finish applications, surfaces should be clean and dry. For stucco applications, surfaces will require rasping and preparation. Consult with material supplier for correct recommendations for each product.



POST COSTRUCTION

Protect EPS foam surfaces remaining in any unfinished condition beyond 90 days with temporary cover materials to minimize UV exposure. Once external finishes are complete, no maintenance is required.

9. Technical Services

NUDURA® Corporation provides experienced technical services personnel on staff for general product query, design assistance and technical support. Additional support is available at the distributor level through NUDURA's® International Network of NUDURA® Product Distributors. Contact the Manufacturer for more information.

10. Filing Systems

- Product Information Sheet
- 10-Part Specification
- 3-Part Specifications for CSI (USA) & CSC (Canada) Masterformat® 2004 Formats- Revised 2010
- Design Specification Manual and Disk available through NUDURA® Sales Managers and Distributor Contacts
- Additional product information is available from the manufacturer and distributor contact upon request.